CONSTRUCTION LEADERS

LETTER OF TRANSMITTAL			
DATE:	**May 4, 2015**	PCL JOB NO:	**5515002**
ATTN:	**Chris Barker**	TRANSMITTAL NO:	**067**

To: **State of Vermont Agency of Transportation**
One National Life Drive
Montpelier, VT 05633-5001
(802) 828-0053

Re: Hartford Lateral Slide
Project No.: IM 091-2(79)
Contract ID.: 12A132 County: Windsor PCL FILE NO: 5515002-36.1

WE ARE SENDING **X** Attached ____ Under separate cover via **Email & SP** the following:
____ Shop drawings ____ Prints **X** Plans ____ Samples ____ Specifications
____ Copy of Letter ____ Change Order ____ Other

COPIES	SPEC.	REVISION	DESCRIPTION
1	**506.18**	**1**	**Girder Erection Plans**

TRANSMITTED for as checked below:

X For approval ____ Approved as submitted ____ Resubmit **1** Copies for approval
____ For your use ____ Approved as noted ____ Submit ____ Copies for distribution
____ As requested ____ Returned for corrections ____ Return ____ Corrected prints
____ For review and comment

Remarks:

The included drawings and calculations have been revised per the Agency's comments dated 4/16/2015.

Please return an email of this approved submittal to Erich Heymann (ewheymann@pcl.com) and Jeremy Mackling (jmackling@pcl.com).

We request the review and return of this submittal within 7 days. Please advise if this request cannot be met so we can plan accordingly.

By: **Erich Heymann,** Project Engineer

COPY TO: Project Files

CONSTRUCTION LEADERS

SUBMITTAL NO. : 36.1
Girder Erection Plans

Item No.	Specification	Description
1	506.18	Girder Erection Plans

PROJECT:
HARTFORD LATERAL SLIDE
PROJECT NO.: IM 091-2(79)
CONTRACT ID.: 12A132

OWNER:
STATE OF VERMONT AGENCY OF TRANSPORTATION

ENGINEER OF RECORD:
STATE OF VERMONT AGENCY OF TRANSPORTATION

CONTRACTOR:
PCL CIVIL CONSTRUCTORS, INC.

MAY 4, 2015

3810 Northdale Blvd., Suite 200; Tampa, FL • (813) 264-9500 • (813) 264-6689 (fax)

CONSTRUCTION

Vermont Agency of Transportation
I-91
Windsor County
Project Number: IM 091-2(79)

Hartford Lateral Slide

Calculations for Temporary Structures including:

Steel Erection
Revision 01

Submitted By,

Apr 29 2015 9:29 AM

Tim Davis, P.E.
VT P.E. 97183

André Tousignant, P.E.
VT P.E. # 100162

April 28, 2015

PCL Civil Constructors Inc.
3810 Northdale Blvd. Suite 200
Tampa, Florida 33624
813-264-9500

TABLE OF CONTENTS

Revision Summary

Revision 01
Updated Rigging and assembly weights

Engineering Calculation Sheet

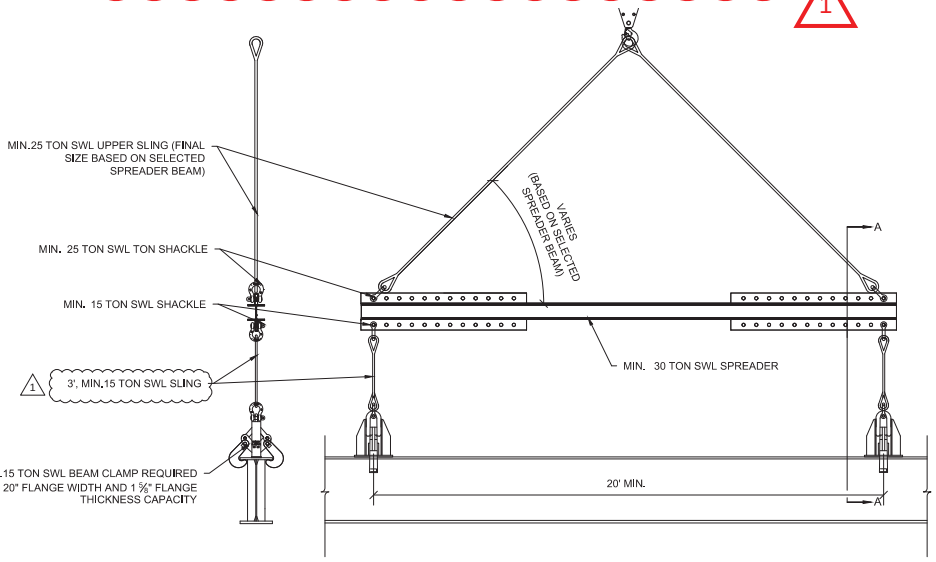
Project	I-91 Hartford	By:	AJT	Date:	
Project#	5515002	Check By:		Date:	
Title:	NB and SB Steel Erection				

Single Girder Rigging Reference

Assembly weight 38.23 kips Shop Dwgs

4 End Diaphragms	5.00 kips	(Max on SB Bridge)
10 Int. Diaphragms	13.00 kips	
Total:	56.23 kips	

1



SECTION A-A SINGLE GIRDER RIGGING DETAIL

Assume Minimum angle of upper sling is 45 degrees

Axial load in upper sling is (56.23kips)/(2)(sin 45)
= 40 kips

Minimum 25 Ton SWL Upper sling Required

Minimum 25 Ton SWL shackle required

Minimum 30 Ton SWL Spreader Required

Minimum 15 Ton SWL shackles required below spreader beam

Minimum 15 Ton SWL slings required below spreader beam

Minimum 15 Ton SWL beam clamp required, 20" wide and 1 5/8" flange capacity.

Engineering Calculation Sheet

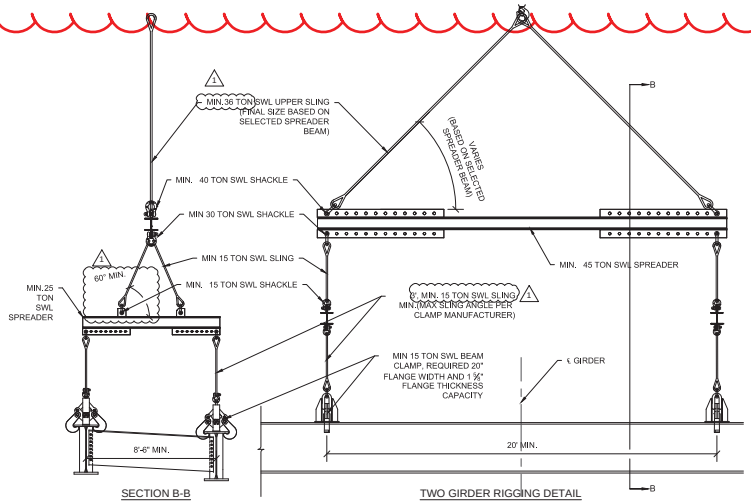
Project	I-91 Hartford	By:	AJT	Date:	
Project#	5515002	Check By:		Date:	
Title:	NB and SB Steel Erection				

Girder Pair Rigging Reference

Assembly weight

G1	38.10	kips	
G2	38.23	kips	Shop Dwgs
2 End Diaphragms	5.14	kips	(Max total Dia. Weight on SB Bridge)
5 Int. Diaphragms	12.86	kips	
Total:	94.33	kips	

1



Assume Minimum angle of upper sling is 45 degrees

Axial load in upper sling is (94.4kips Assembly + 6 kips Rigging Weight)/(2)(sin 45)
= 71 kips

Minimum 36 Ton SWL Upper sling Required

Minimum 40 Ton SWL shackle required

1

Minimum 45 Ton SWL Spreader Required

Assume Minimum angle of lower sling is 60 degrees

Axial load in middle sling is (94.33 kips Assembly + 4 kips Rigging Weight)/(4)(sin 60)
= 28.4 kips

Minimum 15 Ton SWL Middle sling Required

Minimum 15 Ton SWL shackle required

Minimum 25 Ton SWL Spreader Required

Minimum 15 Ton SWL shackles required below spreader beam

Minimum 15 Ton SWL slings required below spreader beam

Minimum 15 Ton SWL beam clamp required, 20" wide and 1 5/8" flange capacity.

Engineering Calculation Sheet

Project	I-91 Hartford	By:	AJT	Date:	
Project#	5515002	Check By:		Date:	
Title:	NB and SB Steel Erection				

Girder Stability

From following sheet, l/b will be used to determine if further stability analyis of girders during erection is required

NB Bridge l/b = [(133.54 ft)-(20 ft.)]*0.5*(12 in.)/(20 in)
= 34 <40, (Cantilever) OK

SB Bridge l/b = [(133.54 ft)-(20 ft.)]*0.5*(12 in.)/(20 in)
= 34 <40, (Cantilever) OK

Girders are braced at ends and minimum of midpoint diaphragm before release from crane. Since unbraced length is half of span, l/b = (133.54)(0.5)(12 in/ft)/20 = 40 <80 (Simple span) OK

CONSTRUCTION LEADERS

CRANE LIFT STUDY ANALYSIS - LONG FORM

(All weights in lbs. unless noted otherswise)

I-91 NB/SB Bridges - 5515002 Date: _____

LOAD INFORMATION:

What is to be lifted: Single Bridge Girder w/ Diaphragms More than one crane ☐ Yes ☑ No

Initial location: Attach Lift Diagram (plan view) if required

Final set location: Attach Lift Diagram (plan view) if required

Verified Weight (weight of load, lbs.) 56,225 How was weight verified: Shop Drawings

Lift Points: ☐ Per Manufactuer

☐ Other, attach details and calculations

Maximum radius of lift: 55 ft Quadrants All

Maximum elevation of lift: Attach lift diagram (elevation view) if required

Maximum allowable wind speed for lift Per Manitowoc, 30 mph (Attach calculations)

GROUND CONDITIONS: Nature of soil Exist. Roadway / Compacted Fill Safe Bearing Capacity 2.5 (tpsf)

Is the use of crane mats or compacted fill required: ☑ Yes ☐ No

CRANE CONFIGURATION: Model/SN Grove GMK 5275 Boom Length/Type 89.3

Maximum Capacity 93,000 Jib Length/Type N/A

Boom Point Elevation at Maximum Working Radius 43.2

Cable Diameter 7/8" Block Capacity 200 Ton No. of Parts 6

Anti-two block device ☑ Yes ☐ No Barge/Crane List N/A

CALCULATIONS

Weight of Load	56,225	1
+ Crane Capacity Deduction	5,925	
+ Plus Rigging Weight	2,575	
= Gross Weight	64,725	Maximum Lift Capacity for Radius 84,000
% of Crane Chart	77%	(Gross weight/Crane capacity) See District Policy

RESPONSIBLE PERSONNEL (Print Name & Sign)

Project Manager _____

Level 1 Lift Specialist _____

Level 2 Lift Specialist (If Critical Lift) _____

Level 3 Lift Specialist (If Engineered Lift) _____

Superintendent _____

Lift Supervior _____

Operator _____

WORKSHEET

Rigging sizes and weights based off of CCS proposed rigging. Shackles assumed larger; conservative

RIGGING

Sling Length		Vertical Length		Max. Sling Load	Tons
Sling Angle		Sling Load Angle Factor	N/A		

	Type	Size	Capacity	Qty	Weight	Capacity > Load?
Slings	2 Inch Wire Rope	40 ft.	37 Ton	2	600.0	OK
Slings	1 1/4 Inch Wire Rope	5 ft.	15 Ton	2	60.0	OK
Slings	None	0	0	0	0.0	
Shackles	Alloy Bolt Type	55	55 Ton	4	343.0	OK
Shackles	Alloy Bolt Type	80	80 Ton	2	192.0	OK
Eye Bolts						
Picking Device	Clamp-Co F-25	16"-24"	25 Ton	2	580.0	OK
Addititional Items	39 T Caldwell Spreader	9 ft.	39 Ton	1	800.0	OK
				TOTAL WEIGHT OF RIGGING	2,575.0	

1

CRANE CAPACITY DEDUCTIONS

	Type	Gross Weight
Block	200 Ton	5,500
Effective Jib Weight		
Boom Extension		
Hook and Overhaul Ball	None	0
Whip Line below boom tip		57
Main Load Cable below tip		368
Stowed Jib or Boom Extension		
TOTAL DEDUCTIONS		5,925

Final checks prior to lift

	Verify gross weight and load chart capacities (de-rated if crane on barge)
	Inspected crane and verified components (Daily logs & annual certification checked)
	Inspected rigging for condition and size
	Inspect load line and drum wrap configuration
	Ground stability. Outrigger pads/blocking sized correctly? Barge/crane list (de-rated chart)
	Distance to nearest utility_____ (above and below ground)
	Weather and wind load consideration, checked & verified at time of lift
	Pre-lift meeting with rigging crew, operator, and signal person (attached sign in sheet
	Rigging drawings attached
	Method of communication (radios, hand signals, etc.) checked & verified
	Lift abort procedures checked and verified. JHA/PSI conducted

PCL CONSTRUCTION LEADERS

CRANE LIFT STUDY ANALYSIS - LONG FORM

(All weights in lbs. unless noted otherswise)

I-91 NB/SB Bridges - 5515002 Date: _____

LOAD INFORMATION:

What is to be lifted: Two Girder Lift More than one crane ☐ Yes ☑ No

Initial location: Attach Lift Diagram (plan view) if required

Final set location: Attach Lift Diagram (plan view) if required

Verified Weight (weight of load, lbs.) 94,325 How was weight verified: Shop Drawings

Lift Points: ☐ Per Manufactuer

☐ Other, attach details and calculations

Maximum radius of lift: 35 ft Quadrants All

Maximum elevation of lift: Attach lift diagram (elevation view) if required

Maximum allowable wind speed for lift Per Manitowoc, 30 mph (Attach calculations)

GROUND CONDITIONS: Nature of soil Exist. Roadway / Compacted Fill Safe Bearing Capacity 2.5 (tpsf)

Is the use of crane mats or compacted fill required: ☑ Yes ☐ No

CRANE CONFIGURATION: Model/SN Grove GMK 5275 Boom Length/Type 89.3

Maximum Capacity 93,000 Jib Length/Type N/A

Boom Point Elevation at Maximum Working Radius 60.5

Cable Diameter 7/8" Block Capacity 200 Ton No. of Parts 6

Anti-two block device ☑ Yes ☐ No Barge/Crane List N/A

CALCULATIONS

Weight of Load	94,325		
+ Crane Capacity Deduction	6,072		
+ Plus Rigging Weight	6,433		
= Gross Weight	106,830	Maximum Lift Capacity for Radius	135,000
% of Crane Chart	79%	(Gross weight/Crane capacity) See District Policy	

1

RESPONSIBLE PERSONNEL (Print Name & Sign)

Project Manager _____

Level 1 Lift Specialist _____

Level 2 Lift Specialist (If Critical Lift) _____

Level 3 Lift Specialist (If Engineered Lift) _____

Superintendent _____

Lift Supervior _____

Operator _____

WORKSHEET

Rigging sizes and weights based off of CCS proposed rigging. Shackles assumed larger; conservative

RIGGING

Sling Length _____ Vertical Length _____ Max. Sling

Sling Angle _____ Sling Load Angle Factor N/A Load _____ Tons

	Type	Size	Capacity	Qty	Weight	Capacity > Load?
Slings	2 Inch Wire Rope	40 ft.	37 Ton	2	600.0	OK
Slings	1 1/4 Inch Wire Rope	10 ft.	15 Ton	4	120.0	OK
Slings	1 1/4 Inch Wire Rope	5 ft.	15 Ton	4	60.0	OK
Shackles	Alloy Bolt Type	55	55 Ton	14	1,200.5	OK
Shackles	Alloy Bolt Type	80	80 Ton	2	192.0	OK
Addititional Items	CCS 35' HSS Spreader	35 ft.	50 Ton	1	1,500.0	OK
Picking Device	Clamp-Co F-25	16"-24"	25 Ton	4	1,160.0	OK
Addititional Items	39 T Caldwell Spreader	9 ft.	39 Ton	2	1,600.0	OK

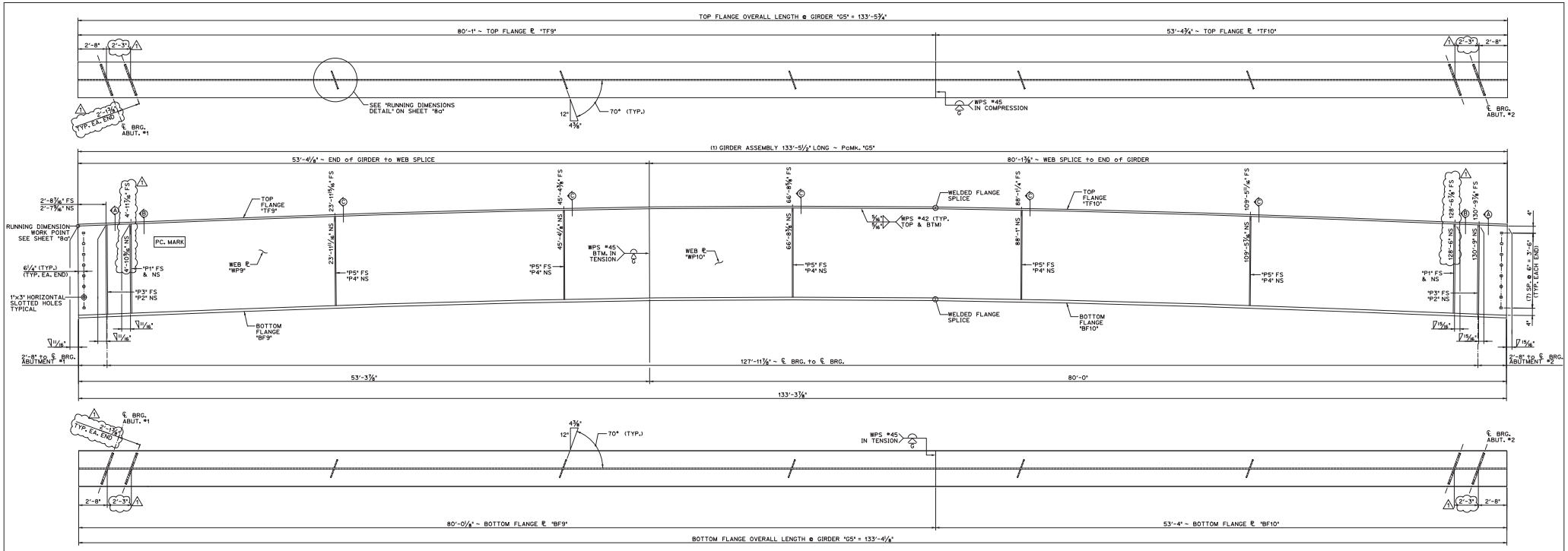
TOTAL WEIGHT OF RIGGING 6,432.5

1

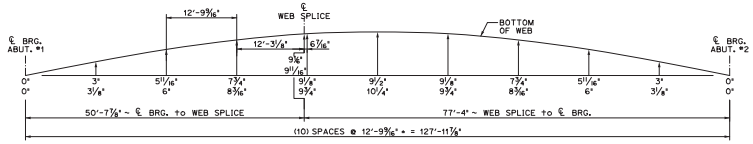
CRANE CAPACITY DEDUCTIONS	Type	Gross Weight
Block	200 Ton	5,500
Effective Jib Weight		
Boom Extension		
Hook and Overhaul Ball	None	0
Whip Line below boom tip		57
Main Load Cable below tip		516
Stowed Jib or Boom Extension		
TOTAL DEDUCTIONS		6,072

Final checks prior to lift

	Verify gross weight and load chart capacities (de-rated if crane on barge)
	Inspected crane and verified components (Daily logs & annual certification checked)
	Inspected rigging for condition and size
	Inspect load line and drum wrap configuration
	Ground stability. Outrigger pads/blocking sized correctly? Barge/crane list (de-rated chart)
	Distance to nearest utility_____ (above and below ground)
	Weather and wind load consideration, checked & verified at time of lift
	Pre-lift meeting with rigging crew, operator, and signal person (attached sign in sheet
	Rigging drawings attached
	Method of communication (radios, hand signals, etc.) checked & verified
	Lift abort procedures checked and verified. JHA/PSI conducted

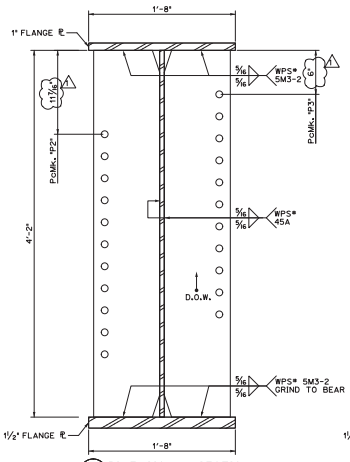


1 6a DIMENSIONAL PLANS & ELEVATIONS ~ GIRDER "G5"
HORIZONTAL SCALE: 1/4" = 1'-0"
VERTICAL SCALE EXAGGERATED 2:1

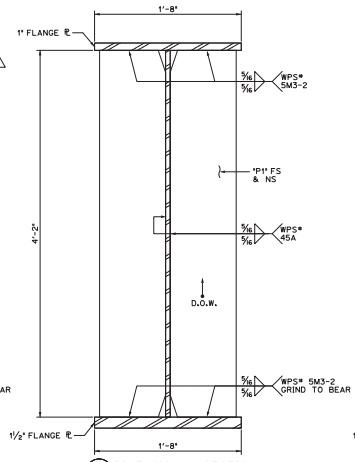


GIRDER "G5" CAMBER

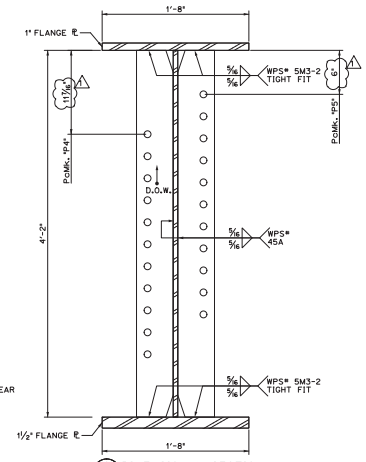
THE TWO CAMBER DIMENSIONS SHOWN REPRESENT THE FOLLOWING:
TOP DIMENSION ~ TOTAL CAMBER IN FINISHED BEAM IN A NO-LOAD POSITION
BTM. DIMENSION ~ TOTAL CAMBER IN BEAM @ TIME OF FABRICATION



A 6a DIMENSIONAL SECTION
SCALE: 1½" = 1'-0"



B 6a DIMENSIONAL SECTION
SCALE: 1½" = 1'-0"



C 6a DIMENSIONAL SECTION
SCALE: 1½" = 1'-0"

BILL OF MATERIALS

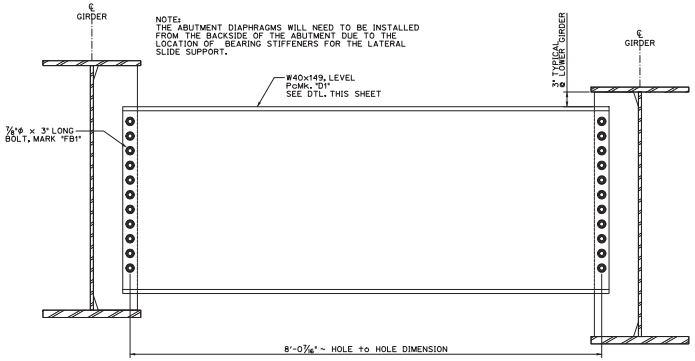
SHIP	SHIP MARK	NO. PCS.	PIECE MARK	DESCRIPTION	LENGTH	REMARKS	MAT'L	
1	G5			BRIDGE GIRDER ASSEMBLY	133'-5½"	38,225#		
		1	WP9	℄ ⅝" × 50"	53'-4¼"	5700#	CVN	
		1	WP10	℄ ⅝" × 50"	80'-1⅜"	8550#	CVN	
		1	TF9	℄ 1" × 20"	80'-1"	5475#	CVN	
		1	TF10	℄ 1" × 20	53'-4¾"	3650#	CVN	
		1	BF9	℄ 1½" × 20"	80'-0⅛"	8200#	CVN	
		1	BF10	℄ 1½" × 20"	53'-4"	5450#	CVN	
		4	P1	SEE SHEET M1				
		2	P2	SEE SHEET M1				
		2	P3	SEE SHEET M1				
		5	P4	SEE SHEET M1				
		5	P5	SEE SHEET M1				

PROJECT No. IM 091-2(79)
ITEM No. 506.55

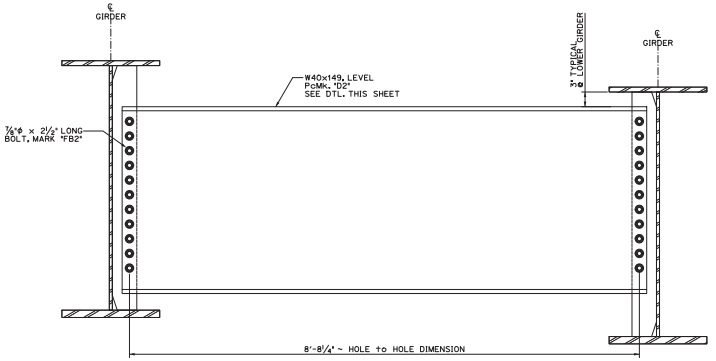
FINISH	SSPC SP10			
MATERIAL	AASHTO M270 (ASTM A709) GRADE 50W			
HOLES	15/16 " Ø U.N.O.			
ELECTRODES	PER WELD PROCEDURE			
WELDS	PER WELD PROCEDURE			
SURFACE PREP SSPC SP6	1	2/5/15	HOLE & PLATE LOCATION	JJH
	NO	DATE	DESCRIPTION	BY
	REVISIONS			

ARC ENTERPRISES, INC.
ADVANCED RESOURCES & CONST. ENTERPRISES, INCORPORATED
P.O. BOX 120 KINGFIELD, ME. 04947
PHONE: (207) 265-2646 ~ FAX: (207) 265-4054

DRAFTER	JJH	SOUTHBOUND GIRDER "G5"	PROJECT NO. 14-180
DATE	JAN. 2015	HARTFORD, VT I-91 SB OVER US RTE 5 PROJECT NUMBER IM 091-2(79)	
CHECKED	GNM		DWG. NO. 6a
DATE	JAN. 2015	PCL CIVIL CONSTRUCTORS	



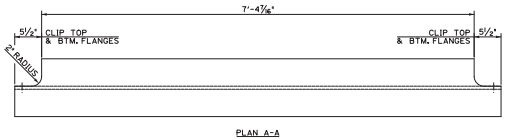
A 9a "D1" TYPE DIAPHRAGMS
SCALE: 1" = 1'-0"
FOR USE @ ABUTMENT LOCATIONS



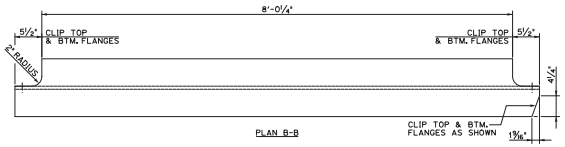
B 9a "D2" TYPE DIAPHRAGMS
SCALE: 1" = 1'-0"
FOR USE @ INTERMEDIATE LOCATIONS

BILL OF MATERIALS

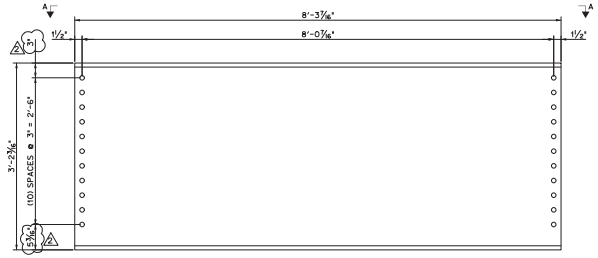
SHIP	SHIP MARK	NO. PCS.	PIECE MARK	DESCRIPTION	LENGTH	WEIGHT	MATERIAL
10	D1			ABUTMENT DIAPHRAGM			
		10	--	W140x149	8'-3⅞"	1240# EACH	
25	D2			INTERMEDIATE DIAPHRAGM			
		25	--	W140x149	8'-11¼"	1340# EACH	



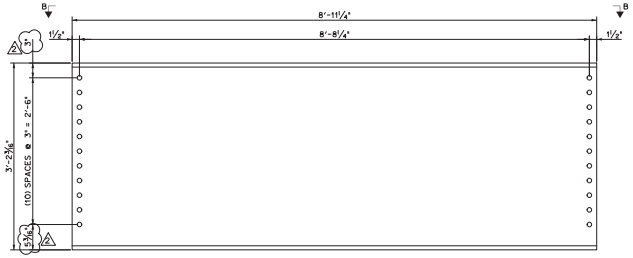
PLAN A-A



PLAN B-B



W40x149 DIAPHRAGM, PcMk. "D1"
SCALE: 1"=1'-0"



W40x149 DIAPHRAGM, PcMk. "D2"
SCALE: 1"=1'-0"

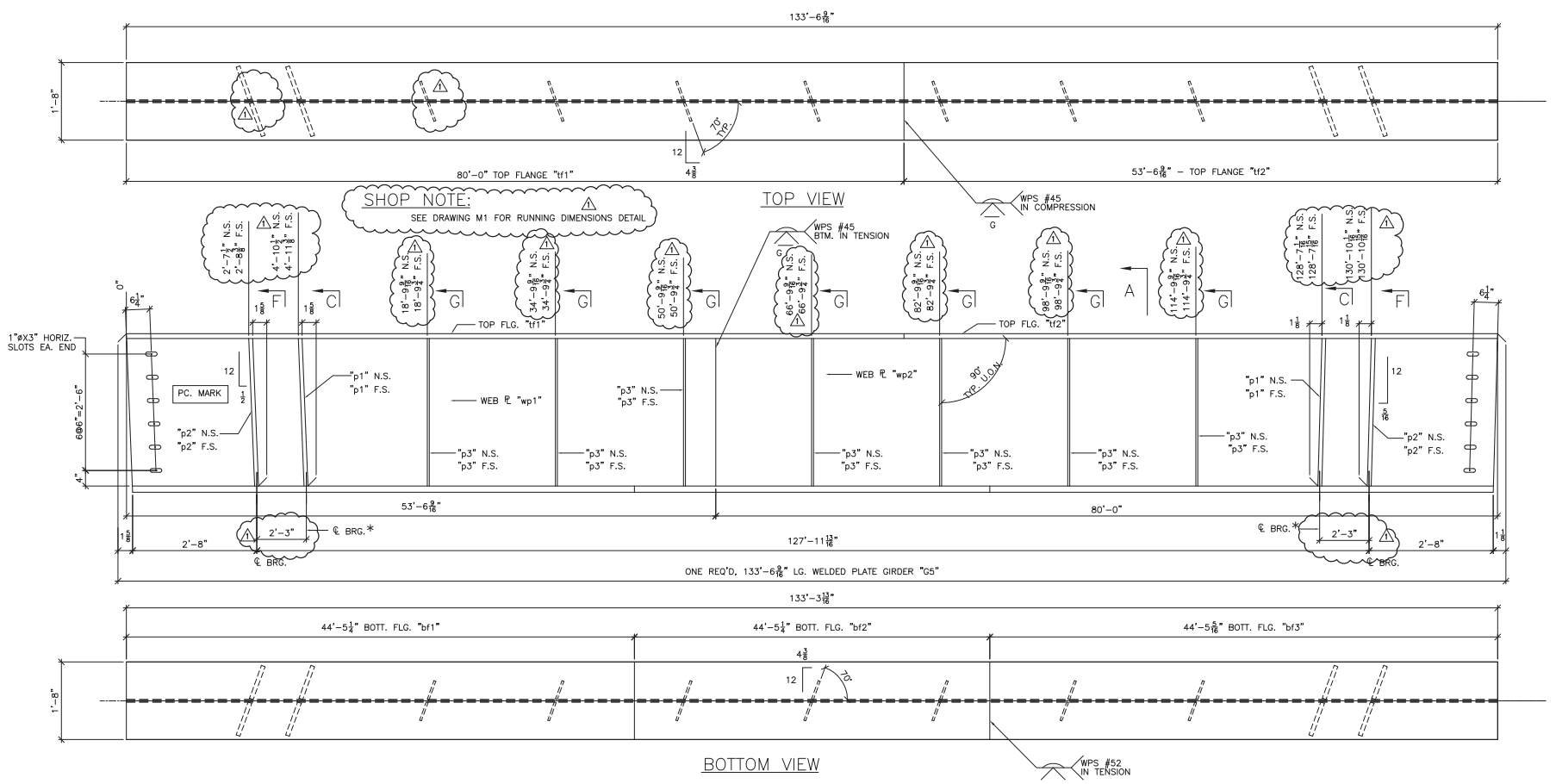
PROJECT No. IM 091-2(79)
ITEM No. 506.50 1

FINISH	1 SSPC SP10			
MATERIAL	AASHTO M270 (ASTM A709) GRADE 50W			
HOLES	15/16 " Ø U.N.O.			
ELECTRODES	PER WELD PROCEDURE			
WELDS	PER WELD PROCEDURE			
SURFACE PREP SSPC SP6	1	2/5/15	HOLE LOCATION	JJH
	NO	DATE	DESCRIPTION	BY

REVISIONS

ARC ENTERPRISES, INC.
ADVANCED RESOURCES & CONST. ENTERPRISES, INCORPORATED
P.O. BOX 120 KINGFIELD, ME. 04947
PHONE: (207) 265-2646 - FAX: (207) 265-4054

DRAFTER	JJH	SOUTHBOUND DIAPHRAGM DETAILS	PROJECT NO. 14-180
DATE	JAN. 2015	HARTFORD, VT I-91 SB OVER US RTE 5 PROJECT NUMBER IM 091-2(79)	
CHECKED	GNM	PCL CIVIL CONSTRUCTORS	DWG. NO. 9a
DATE	JAN. 2015		

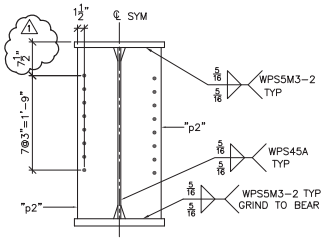


* STIFFENER FOR LATERAL SLIDE SUPPORT

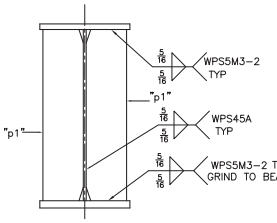
BILL OF MATERIAL

SHIP	SHIP MARK	NO. PCS.	PIECE MARK	DESCRIPTION	LENGTH	REMARKS	WT.
1	G5			WELDED PLATE GIRDER			38055
		1	wp1	PL 9/16X38	53'-6 9/16	CVN	4328
		1	wp2	PL 9/16X38	80'-0	CVN	6466
		1	tp1	PL 1 1/4X20	80'-0	CVN	6806
		1	tp2	PL 1 1/4X20	53'-6 9/16	CVN	4556
		1	bp1	PL 1 5/8X20	44'-5 1/4	CVN	4915
		1	bp2	PL 1 5/8X20	44'-5 1/4	CVN	4915
		1	bp3	PL 1 5/8X20	44'-5 5/16	CVN	4915
		4	p1	SEE SHT. M2			
		4	p2	SEE SHT. M2			
		14	p3	SEE SHT. M2			

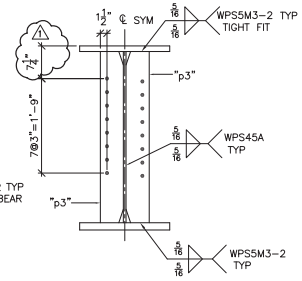
BOTTOM FLANGE ℄ MATERIAL SHALL BE ASTM A709 GR. HPS 70W



SECTION F



SECTION C



SECTION G

SHOP NOTE:
ENTIRE TOP FLANGE IS IN COMPRESSION
ENTIRE BOTT FLANGE IS IN TENSION

FINISH	SSPC SP10				
MATERIAL	AASHTO M270 (ASTM A709) GR. 50W U.O.N.				
HOLES	15/16"ø U.O.N.				
ELECTRODES					
WELDS	PER WPS				
SURFACE PREP		1	1/29/15	AS NOTED	JAC
		NO	DATE	DESCRIPTION	BY

REVISIONS

ARC ENTERPRISES, INC.
ADVANCED RESOURCES & CONST. ENTERPRISES, INCORPORATED
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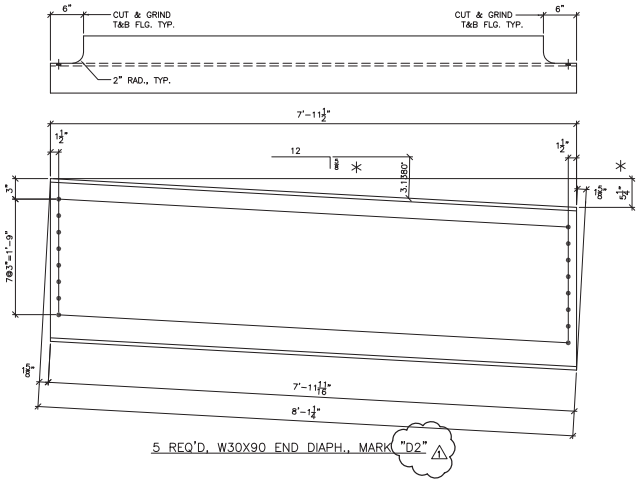
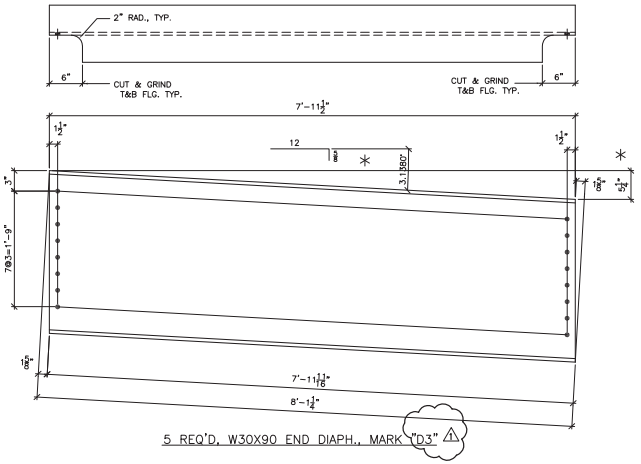
DRAFTER	JAC	STRINGER DETAILS, G5	PROJECT NO. 14-180
DATE	1/6/15	HARTFORD, VT I-91 NB OVER US RTE. 5 PROJECT NUMBER IM 091-2(79)	
CHECKED	JS	G.C. PCL CIVIL CONSTRUCTORS	DWG. NO. 6
DATE	1/14/15		

SEE SHEET M1 FOR CAMBER AND SECTIONS & DETAILS NOT SHOWN



5 REQ'D, W30X90 END DIAPH., MARK "D2" ⚠1



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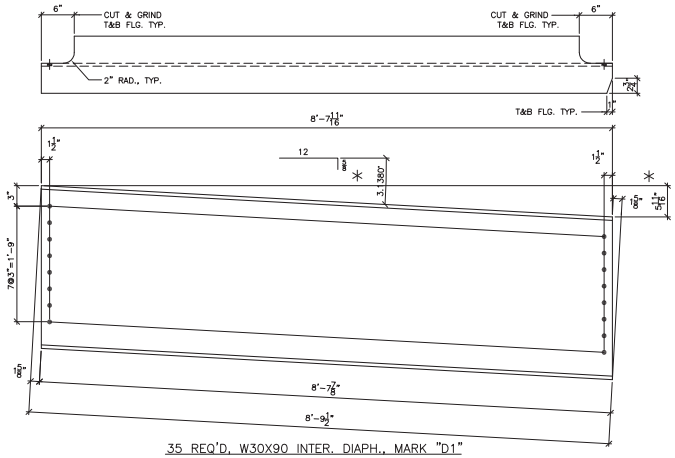

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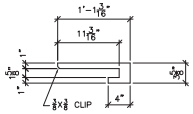
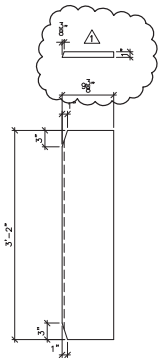
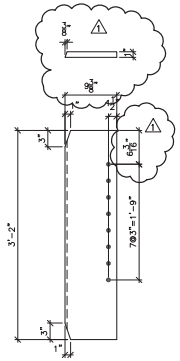


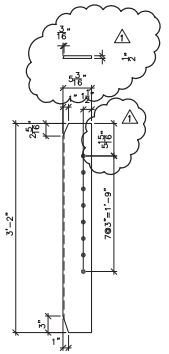
2 REQ'D, ¼" DRIP PL, MARK "dp1"



28 REQ'D, 1" STIFF. PL, MARK "p1"



20 REQ'D, 1" STIFF./CONN. PL, MARK "p2"



70 REQ'D, ½" CONN. PL, MARK "p3"

* NOTE: ⚠1
DIAPHRAGM SLOPE IS CALCULATED BY USING CONNECTION HOLE LOCATIONS IN CONNECTION PLATE

BILL OF MATERIAL

SHIP	SHIP MARK	NO. PCS.	PIECE MARK	DESCRIPTION	LENGTH	REMARKS	WT.	
		28	p1	PL 1X9⅜	3'-2		2716	
		20	p2	PL 1X9⅜	3'-2		1940	
		70	p3	PL ½X5 5/16	3'-2		1890	
		2	dp1	PL ¼X3⅜	1'-1 3/16		3	
	D1	35		W30X90	8'-9½		26775	
	D2	5		W30X90	8'-1¼		3510	
	D3	5		W30X90	8'-1¼		3510	

FINISH	⚠1 SSPC SP10				
MATERIAL	ASTM A709 GRADE 50W U.O.N.				
HOLES	15/16"ø U.O.N.				
ELECTRODES					
WELDS	PER WPS				
SURFACE PREP		⚠1	1/29/15	AS NOTED	JAC
		NO	DATE	DESCRIPTION	BY
		REVISIONS			

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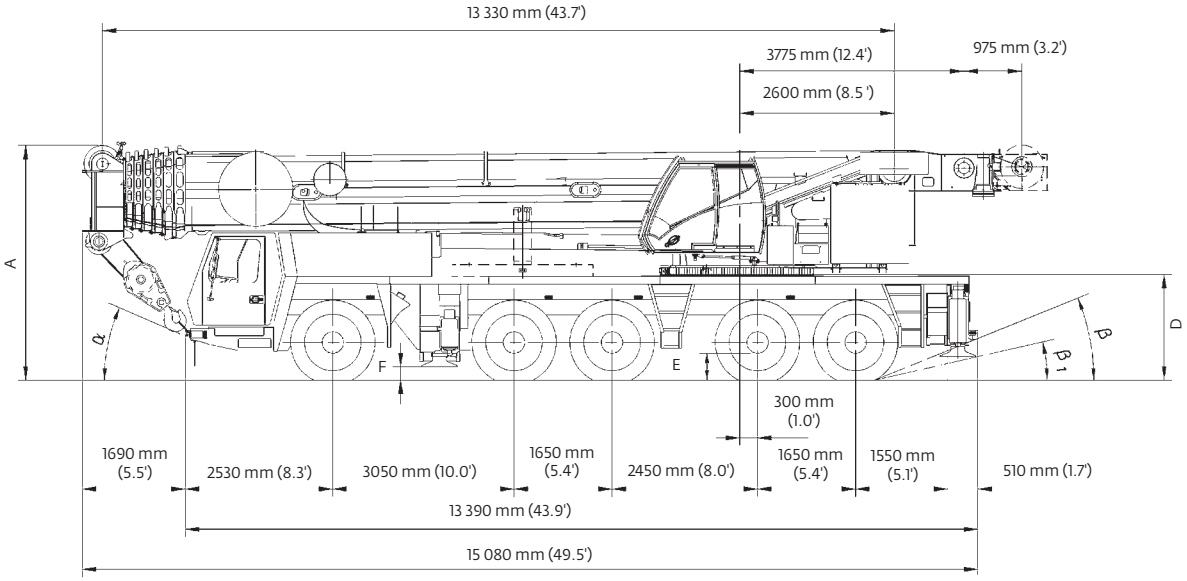
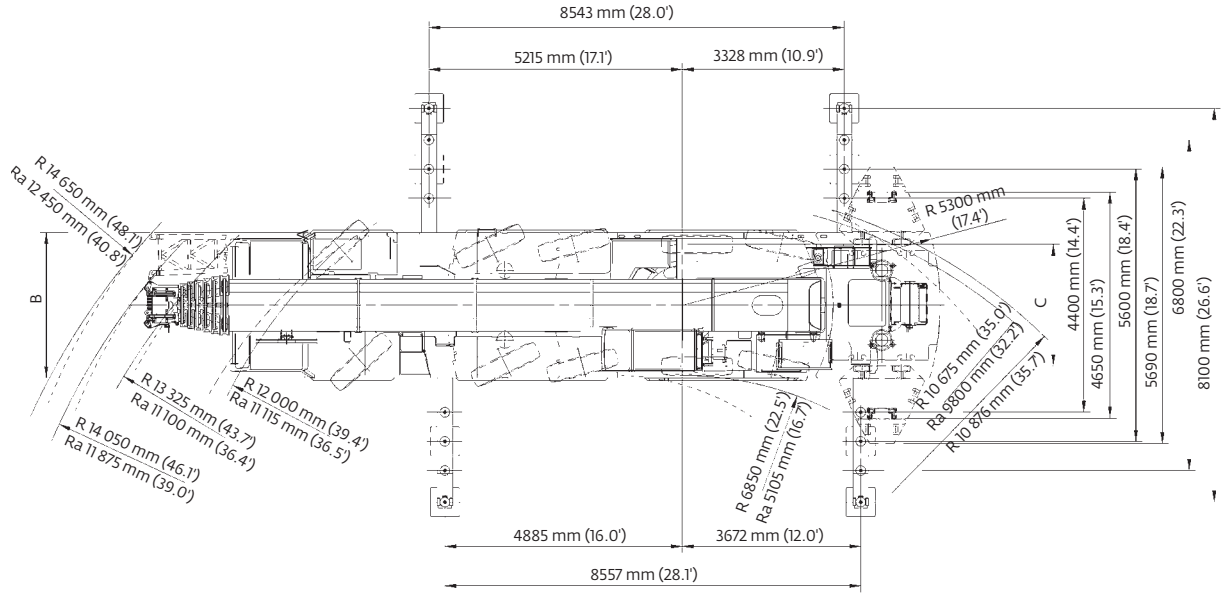
DRAFTER	JAC	MISC. DETAILS	PROJECT NO. 14-180
DATE	1/09/15	HARTFORD, VT I-95 NB OVER US RTE. 5	
CHECKED	JS	PROJECT NUMBER IM 091-2(79)	DWG. NO. M2
DATE	1/14/15	CUSTOMER: PCL CIVIL CONSTRUCTORS	

Dimensions
Cummins





Tires	A	A *130 mm (0.4')	B	C	D	E	F	α	β	β 1
14.00 R25	3950 mm (13')	3820 mm (12.5')	2990 mm (9.8')	2570 mm (8.4')	1780 mm (5.8')	400 mm (1.3')	228 mm (0.7')	23°	22°	13°
16.00 R25	4000 mm (13.1')	3870 mm (12.7')	3000 mm (9.8')	2510 mm (8.2')	1830 mm (6.0')	450 mm (1.5')	258 mm (0.8')	25°	24°	15°
20.5 R25	4000 mm (13.1')	3870 mm (12.7')	3000 mm (9.8')	2530 mm (8.3')	1830 mm (6.0')	450 mm (1.5')	258 mm (0.8')	25°	24°	15°

Ra = Radius all wheels steered
*Lowered

3 119 100

	Crane with 169 700 lbs (77 t) counterweight									
	Outrigger base - length 28.1 ft - width 26.6 ft									
	Main boom - fixed length in ft									
	87.3	87.9	88.5	88.8	89.3	102.1	102.2	102.9	103.7	104.2
Tel. sec. I	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.50
Tel. sec. II	0.00	0.00	0.00	0.50	0.50	0.00	0.00	0.00	0.50	0.50
Tel. sec. III	0.00	0.00	0.50	0.50	0.50	0.00	0.00	0.50	0.50	0.50
Tel. sec. IV	0.00	0.50	0.50	0.50	0.00	0.00	0.50	0.50	0.50	0.50
Tel. sec. V	0.50	0.50	0.50	0.00	0.00	1.00	0.50	0.50	0.50	0.00
Tel. sec. VI	1.00	0.50	0.00	0.00	0.00	1.00	1.00	0.50	0.00	0.00
Slewing range	360°									
Radius in feet	Lifting capacities in 1000 lbs									
10.0	81.0	116.0	146.0	185.0	244.0					
15.0	78.0	116.0	146.0	185.0	242.0	70.0	81.0	116.0	146.0	185.0
20.0	66.0	107.0	146.0	180.0	212.0	59.0	72.0	115.0	146.0	182.0
25.0	57.0	94.0	126.0	157.0	181.0	51.0	63.0	102.0	137.0	166.0
30.0	50.0	84.0	111.0	138.0	155.0	45.0	56.0	92.0	122.0	151.0
35.0	44.0	75.0	98.0	123.0	135.0	39.4	50.0	83.0	110.0	136.0
40.0	39.4	68.0	88.0	110.0	118.0	35.4	45.0	76.0	99.0	120.0
45.0	36.0	62.0	79.0	99.0	104.0	32.2	40.8	70.0	90.0	106.0
50.0	33.0	57.0	72.0	90.0	93.0	29.4	37.6	65.0	82.0	95.0
55.0	30.6	53.0	66.0	82.0	84.0	27.2	34.8	60.0	75.0	85.0
60.0	28.2	50.0	61.0	76.0	75.0	25.0	32.4	56.0	69.0	77.0
65.0	26.4	47.0	57.0	70.0	69.0	23.2	30.4	52.0	63.0	70.0
70.0	24.8	43.6	53.0	63.0	60.0	21.0	28.4	48.0	59.0	64.0
75.0			50.0	50.0	48.0	19.2	26.8	45.0	55.0	58.0
80.0						18.0	25.4	41.6	52.0	53.0
85.0						17.0	24.2	39.2	49.0	46.0
90.0						16.2	22.2	37.2	39.2	36.8
SLI Code	2200									
Max. permitted windspeed	**14 m/s**			**11 m/s**	**10 m/s**	**14 m/s**			**11 m/s**	**9 m/s**

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nautical miles
Convert!
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liters
in³
ft³
us gal
Convert!
Velocity
1
m/s
km/h
ft/min
ft/s
mph
knots
Convert!
Pressure
1

Friction and Coefficients of Friction

Friction theory and coefficients of friction for some common materials and materials combinations

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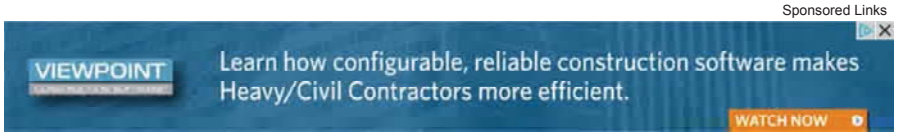


Frictional force can be expressed as

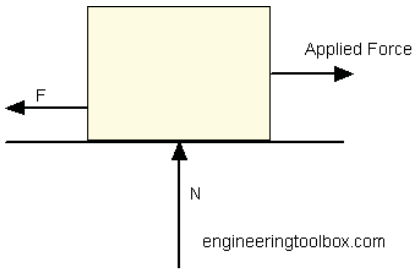
$$F_f = \mu \cdot N \qquad (1)$$

where

F_f = *frictional force (N, lb)*

μ = *static (μ_s) or kinetic (μ_k) frictional coefficient*

N = *normal force (N, lb)*



For an object pulled or pushed horizontally, the normal force - N - is simply the weight:

$$N = m \cdot g \qquad (2)$$

where

m = *mass of the object (kg, slugs)*

g = *acceleration of gravity (9.81 m/s², 32 ft/s²)*

Frictional Coefficients for some Common Materials and Materials Combinations

Materials and Material Combinations		Static Frictional Coefficient - μ_s	
		Clean and Dry Surfaces	Lubricated and Greasy Surfaces
Aluminum	Aluminum	1.05 - 1.35	0.3
Aluminum-bronze	Steel	0.45	
Aluminum	Mild Steel	0.61	
Brake material	Cast iron	0.4	
Brake material	Cast iron (wet)	0.2	
Brass	Steel	0.35	0.19
Brass	Cast Iron	0.3[1)]	
Brick	Wood	0.6	
Bronze	Steel		0.16
Bronze	Cast Iron	0.22[1)]	
Bronze - sintered	Steel		0.13
Cadmium	Cadmium	0.5	0.05
Cadmium	Chromium	0.41	0.34
Cadmium	Mild Steel	0.46[1)]	
Cast Iron	Cast Iron	1.1, 0.15[1)]	0.07[1)]
Cast Iron	Oak	0.49[1)]	0.075[1]
Cast iron	Mild Steel	0.4, 0.23[1)]	0.21, 0.133[1)]
Carbon (hard)	Carbon	0.16	0.12 - 0.14

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mm H_2O
kg/cm^2
psi
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m^3/h
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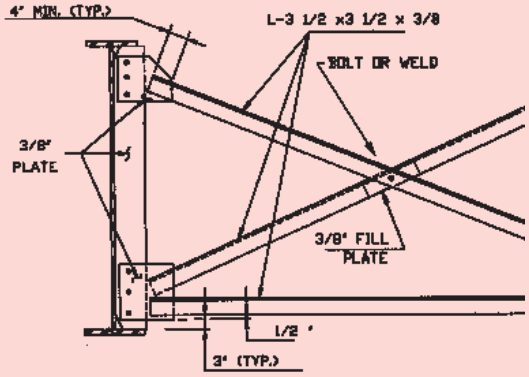
Materials and Material Combinations		Static Frictional Coefficient - μ_s	
		Clean and Dry Surfaces	Lubricated and Greasy Surfaces
Carbon	Steel	0.14	0.11 - 0.14
Chromium	Chromium	0.41	0.34
Copper-Lead alloy	Steel	0.22	
Copper	Copper	1	0.08
Copper	Cast Iron	1.05, 0.29[1)]	
Copper	Mild Steel	0.53, 0.36[1)]	0.18[1)]
Diamond	Diamond	0.1	0.05 - 0.1
Diamond	Metal	0.1 - 0.15	0.1
Glass	Glass	0.9 - 1.0, 0.4[1)]	0.1 - 0.6, 0.09-0.12[1)]
Glass	Metal	0.5 - 0.7	0.2 - 0.3
Glass	Nickel	0.78	0.56
Graphite	Steel	0.1	0.1
Graphite	Graphite (in vacuum)	0.5 - 0.8	
Graphite	Graphite	0.1	0.1
Hemp rope	Timber	0.5	
Ice	Wood	0.05	
Iron	Iron	1.0	0.15 - 0.20
Lead	Cast Iron	0.43[1)]	
Leather	Oak	0.61, 052[1]	
Leather	Metal	0.4	0.2
Leather	Wood	0.3 - 0.4	
Leather	Clean Metal	0.6	
Leather fiber	Cast iron	0.31	
Leather fiber	Aluminum	0.30	
Magnesium	Magnesium	0.6	0.08
Nickel	Nickel	0.7 - 1.1, 0.53[1)]	0.28, 0.12[1)]
Nickel	Mild Steel	0.64[1)]	0.178[1)]
Nylon	Nylon	0.15 - 0.25	
Oak	Oak (parallel grain)	0.62, 0.48[1)]	
Oak	Oak (cross grain)	0.54, 0.32[1]	0.072[1]
Paper	Cast Iron	0.20	
Phosphor-bronze	Steel	0.35	
Platinum	Platinum	1.2	0.25
Plexiglas	Plexiglas	0.8	0.8
Plexiglas	Steel	0.4-0.5	0.4 - 0.5
Polystyrene	Polystyrene	0.5	0.5
Polystyrene	Steel	0.3-0.35	0.3 - 0.35
Polythene	Steel	0.2	0.2
Polystyrene	Polystyrene	0.5	0.5
Rubber	Cardboard	0.5 - 0.8	
Rubber	Dry Asphalt	0.9 (0.5 - 0.8)[1)]	
Rubber	Wet Asphalt	0.25 - 0.75[1)]	
Rubber	Dry Concrete	0.6 - 0.85[1)]	
Rubber	Wet Concrete	0.45 - 0.75[1)]	
Silver	Silver	1.4	0.55
Sapphire	Sapphire	0.2	0.2
Silver	Silver	1.4	0.55
Steel	Steel	0.8	0.16
Straw Fiber	Cast Iron	0.26	
Straw Fiber	Aluminum	0.27	
Tarred fiber	Cast Iron	0.15	
Tarred fiber	Aluminum	0.18	
Teflon	Teflon	0.04	0.04, 0.04[1)]
Teflon	Steel	0.05 - 0.2	
Tungsten Carbide	Steel	0.4-0.6	0.1 - 0.2
Tungsten Carbide	Tungsten Carbide	0.2 - 0.25	0.12
Tungsten Carbide	Copper	0.35	
Tungsten Carbide	Iron	0.8	
Tin	Cast Iron	0.32[1)]	
Tire, dry	Road, dry	1	
Tire, wet	Road, wet	0.2	
Wood	Clean Wood	0.25 - 0.5	
Wood	Wet Wood	0.2	

Use 0.3 for design



BRIDGE CROSSINGS
No. 11, October 1997
Practical Information For The Bridge Industry

ERECTION ENGINEERING FOR STEEL BRIDGE SUPERSTRUCTURES

By Steven A. Weinhold, P.E.

In the past, bridge engineers have been primarily responsible for the structural integrity of the completed structure, not for the partially completed structure or "erection stage" of the job. This responsibility is changing rapidly as new specifications now require the design engineer to investigate the structural stability of the bridge superstructure while the bridge deck is being cast. Due to the competitiveness of designs between steel, concrete and various composite materials, designers are constantly striving for longer spans, lighter girders and wider girder spacings (to name a few). However, these factors may create stability and accessibility problems for shipping and erection that weren't of great concern in the past.

We all live in a competitive bidding environment. The design engineer needs to understand the implications of these new designs and factors. They may create additional costs for the shipping and erection phases of the project: What is saved on material and fabrication costs may not offset the additional costs of shipping and erection of the steel bridge superstructure.

The intent of this article is to give a brief introduction to the world of steel bridge erection engineering and to provide information for design engineers so that they may have a better understanding of what is involved in some of the planning used to create an erection procedure.

Crane Information

There are three basic types of cranes used to erect steel bridges. All three have advantages and disadvantages. Choosing a particular crane or cranes for a project depends on several conditions. These include: the sizes and weights of the girders being erected; availability of equipment; and site conditions.

- Conventional truck crane with lattice boom. This is probably the most popular and practical crane to use on construction projects that have a sizeable duration due to the crane's lifting and reaching capacities. The crane can be moved from job-to-job under its own power, but the boom sections and counter weights must be hauled separately on trucks. Also, most of these cranes require an assist crane to assemble them on-site. Truck cranes can pick the load either over the rear or side of the machine depending upon which counterweights are used. They transmit the load to the earth via the outriggers. Outriggers are designed for vertical loads only and therefore should be placed on a level surface.
- Hydraulic crane with telescopic boom. This type of crane usually requires less assembly than the conventional truck crane but has approximately one-half the capacity of similar conventional cranes. In other words, a 70-ton conventional crane has similar reaching and lifting capacities as a 140-ton hydraulic crane. Hydraulic cranes are good for both short-duration jobs, due to the low shipping costs, and for jobs with tight quarters in which the telescopic boom becomes advantageous versus the fixed length of a lattice boom.
- Crawler crane with lattice boom. This type of crane runs on tracks or "crawlers" that are spread far enough apart that they don't have to use outriggers as do the truck cranes. Crawler cranes have big mobilization costs due to the number of truck loads required to move all the components. There are, however, advantages to using a crawler crane. First is its ability to move while picking up a load. The crawlers can handle lateral loads, unlike the outriggers on the truck cranes. Also, the cranes can rotate 360 degrees while picking up a load.

Site Conditions

Site conditions usually dictate how the bridge will be erected and how the steel will be delivered. Site conditions can be improved by the general contractor if the contract documents allow them to do so. However, conditions such as overhead power

lines, roads, navigable canals, rail roads, streams, rivers or wetlands often won't allow for adjusting the site conditions. If the site conditions cannot be adjusted, then the contractor must work around all of these in order to erect the bridge, which adds to the cost of the project. Fortunately, proper planning during the design stage of the project may eliminate some or all of these costs. Consultants should remember that the most cost-effective solution for girder erection is to deliver each girder segment to the erection site on a truck loaded at the fabricator's shop, pick the girder directly from the truck with a single crane at the premarked center of gravity without any temporary reinforcement, and put it into its final position without any falsework or temporary support. Therefore, it is imperative that proper planning be done (preferably at the design stage) to provide access for both the crane and the delivery truck at the same time and in the same area in order for the crane to immediately pick the girder directly off the truck. Also, the design engineer can possibly eliminate the need for falsework or temporary support if they consider this condition during the design stage and make the girder sections large enough to withstand the imposed stresses.

How Big Can I Make This Girder?

A properly designed steel bridge is very strong and stable when it is fully erected and all the bolts are installed. But take a individual, long member that has a small compression flange and a relatively large bending moment due to its self weight and there might be a problem. How can it be shipped? How can it be erected? A principle consideration is the lateral stability of girders due to their large unsupported length during shipping and erection. Consultants often ask: "What's the smallest size flange I can use on a girder?" I don't believe there is an exact answer to that question. Rather, it has to be investigated on an individual basis. However, there are some guidelines:

Shipping:

Length—up to 150' is preferred. Longer girders are possible but must be examined on an individual basis. Most states allow up to 80' without restrictions.

Height—a load height of up to 14' is possible. Most trailers are approximately 4' high. Add approximately 6" for dunnage. Therefore, overall girder height should not exceed 8'-6".

Width—widths up to 16' may be possible with permits and police escorts. If girders must be laid down (on their axis) they must be fully supported along their entire length.

Weight—Pieces up to 40 tons are commonly accomplished with permits. Weights up to 100 tons are possible, but require cooperation with all states along the route.

Flange Size—try not to use less than a 14" width. Remember: the wider the flange width, the easier it is to ship and erect the girder. This is especially true with curved girders.

Want to know if the girder you designed can be shipped? Refer to Figure 1, which represents a two-support condition that commonly occurs when shipping large girders. Put your girder on the truck and see if it works. The girder is laterally supported only at its reaction points. When calculating the actual stresses, you need to add 200% to the actual stress to account for impact; that is, $f_b + 2f_b = 3f_b$, which must be less than the allowable stress, F_b.

Erection:

The possibility of lateral buckling of girders during erection must be investigated when long, slender girders are involved. Many girders are designed to be stable only when their compression flanges are supported laterally. An approximate determination of the stability of a girder may be made by taking the ratio of the overall length of the girder (in inches) to the compression flange width (in inches), or simply l/b. Experience has indicated that, as a general, rule girders with an l/b of less than 60 will be stable during erection. For values between 60 and 80, stability is questionable, but may be OK, though further investigation of stresses is required. For values over 80, the girder will be unstable and will require some sort of temporary support.

Rigging, Stresses And Stability:

Girders are erected by either one or two cranes.

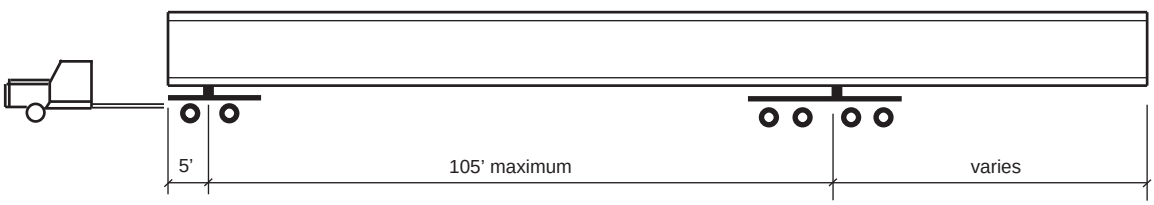


Figure 1: How Big Can I Make This Girder?

When one crane is used, the girder can have one pick point or two. When two lifting points are required, but only one crane is available, a spreader beam can be used in order to avoid putting compression forces into the girder being lifted. A spreader beam is designed as a beam-column that resists the horizontal force component of the wire ropes that connect to the crane hook. The angle of these wire ropes should be greater than or equal to 45 degrees.

When two cranes are used to connect, the girder can have two, three or four pick points, depending on whether spreader beams are used by one or both cranes. When utilizing two cranes, the load that each crane picks is determined knowing the distances from the center of gravity of the girder to each of the pick points.

Two basic devices are used to connect the girder to the crane hook. One is wire rope slings that can be used in a vertical, chocked or basketed arrangement. The chocked arrangement has approximately three-quarters the capacity of a vertical arrangement, and the basketed sling capacity has twice that of the vertical sling. When picking beams and girders, the vertical load is applied to the edge of the vertical sling. Therefore, bending stresses in the bottom flange and web buckling may need to be checked. Temporary hardwood stiffeners can be used between the flanges to help reinforce the girder if required. The other lifting device commonly used is a beam clamp. Beam clamps connect directly to the top flange of the girder. When using beam clamps, the bending stresses in the top flange of the girder must be checked as well as the stresses in the flange-to-web connection. The load can be distributed along the flange a distance equal to the width of the beam clamp plus twice the distance from the bearing point to the face of the girder web.

One of the primary goals of the erector is to get two lines of girders erected with crossframes attached in order to achieve stability and eliminate the possibility of the girders overturning. Once two girders are in place with the diaphragms connected, stability concerns relative to steel erection usually are eliminated. With the addition of the second girder line and crossbracing between them, the governing instability mode changes from torsional-flexural buckling of the single girder to primarily flexural buckling of the two girders acting as a unit. Another alternative is to erect the girders in pairs with their corresponding crossframes attached. Once the pair of girders is erected, the remaining girders can be set as single units. However, paired girder erection isn't always possible due to the large crane required to lift the unit. While sometimes paired girders can be lifted using two cranes, often access for both cranes to setup near the girder pair is a problem.

Curved girder erection does not differ greatly from straight girder erection except that temporary shoring or a holding crane may be necessary to stabilize the first girder until the second girder can be erected with its corresponding crossframes. This isn't always possible and is dependent on if there is an area to either setup this shoring or mobilize a holding crane. The center of gravity of a curved girder is not in the plane of the web, which creates a tendency for the girder to want to rotate or "roll". Upon the erection of the second girder and the attachment of crossframes, the two-girder unit is now located between adjacent supports, which creates positive reactions at all the bearing locations and therefore eliminates this tendency to roll.

Steven A. Weinhold, P.E., is a senior engineer with High Steel Structures, Inc., in Lancaster, PA. He has a Masters of Science from Penn State University and has been with High Steel for eight years.

NATIONAL STEEL BRIDGE ALLIANCE
1405 North Lilac Dr., Suite 212
Golden Valley, MN 55422
ph: 612/591-9099 • fax: 612/591-9499

The mission of The National Steel Bridge Alliance (NSBA), which was formed in 1995, is to enhance the art and science of the design and construction of steel bridges. Its activities include organizing meetings, conferences and national symposia, conducting the Prize Bridge Awards competition, supporting research, developing design aids, and providing assistance to bridge owners and designers. The NSBA membership includes representatives from all aspects of the steel bridge industry.

Girder Pair 102G7A & 103G7A, Double pick:

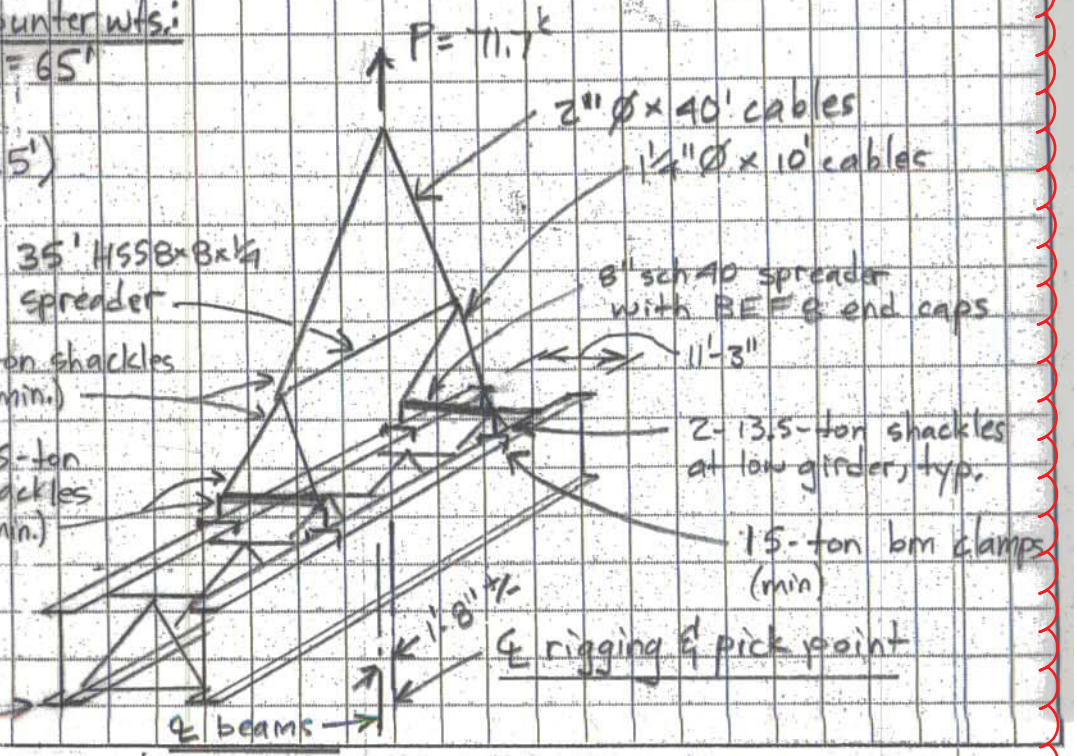
1

item weights:	wt.	capacity
102G7A	27.007k	
103G7A	27.007k	
122CF1	0.847k	
125CF4	0.733k	
125CF2	0.751k	
124CF2 ×2	1.512k	
girder splice Pls ×2 splices	4.684k	
45 or 25-ton bm clamps ×4	1.160k	30k ea / 120k total
9.5-ton shackles ×8	0.080k	19k ea / 66k total @ ∠ ±½
1¼"Ø × 10' rigging ×4	0.174k	26 k ea / 86k total @ ∠ ±½
25-ton shackles ×4	0.180k	50 k ea / 173k total @ ∠ ±½
HSS 8×8×¼ spreader ×35'	1.430k	119.4k
BEF 8 end caps ×4	0.531k	> 76 k ea / 152k total pair
8"Ø sch 40 pipe spreader ×11'-3"×2	0.694k	64k ea / 110k total @ ∠ ±½
2"Ø×40' rigging ×2	0.790k	
crane block	3.5k	
load line	0.6k	
13.5-ton shackles ×4	0.06k	
	71.7k	

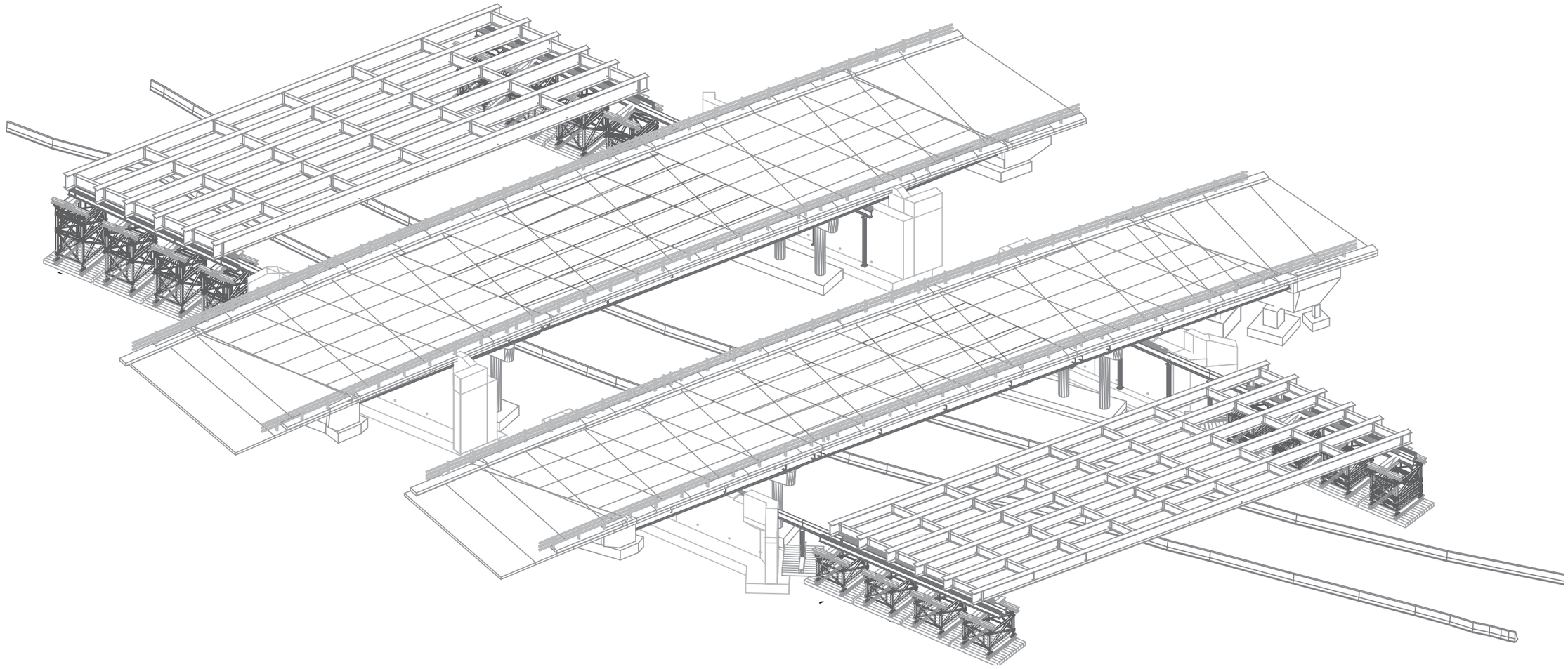
PROPOSED RIGGING USED FOR WEIGHTS ONLY

STATE OF VERMONT
ANDREW D. WHITE
NO. 9030
STRUCTURAL
LICENSED
PROFESSIONAL ENGINEER
6/14/11

GMK 5275 with 169k counter wts:
good for 72.0k @ R = 65'
with 119 ft boom
(required radius = 55.5')



CCS CONSTRUCTORS, LLC 138 MUNSON AVE. MORRISVILLE, VT 05661 PH. 802-888-7701 FX. 802-888-1746	PROJECT NAME Brattleboro		PROJECT NO. IM091-1(50)
	"A" girder pair		DRAWING NO. Sk-1
	SCALE N.T.S.	DATE 6/8/11	



GIRDER ERECTION PLAN

GENERAL NOTES

DRAWINGS SHALL NOT BE SCALED

ANY CHANGES SHALL BE APPROVED BY THE ENGINEER

MATERIALS SHALL BE NEW OR IN GOOD CONDITION AND APPROVED BY THE DESIGN ENGINEER.

ALL WELDS ARE TO FOLLOW CURRENT AWS STANDARDS

ALL WORK OVER US-5 TO BE PERFORMED UNDER FLAGGING OPERATIONS PER THE TRAFFIC CONTROL PLAN

ERECTION SHALL NOT OCCUR IN WINDS EXCEEDING 20 MPH

DESIGN AIDS

-ASD NINTH ED. (STEEL)
-AASHTO GUIDE DESIGN SPECIFICATIONS FOR BRIDGE TEMPORARY WORKS

MATERIAL PROPERTIES

STEEL
- PLATE, ANGLE, MISC.
  - ASTM A36 Fy = 36 ksi MIN

BOLTS
- ALL BOLTS SHALL BE A325 U.N.O.
-

LIST OF DRAWINGS

Revision No. & Date	Vermont Agency of Transportation			Drawing Status		Name	Date	PCL Civil Constructors, Inc.	
				Apr 29 2015 2:34 PM	Drawn By	AJT	04/01/15	3810 Northdale Blvd. Suite 200, Tampa Florida 33624	
	Road No.	County / City	Financial Project ID No.	FOR CONSTRUCTION	Design By	AJT	04/01/15	Submittal LATERAL SLIDE SYSTEM	PCL Project / Job No. I-91 Hartford / 5514001
	I-91	Windsor / Hartford	IM 091-2(79)		Check By	TMD	04/07/15	Drawing Title ERECTION TITLE PAGE	Sheet No. 01

STATE OF VERMONT TIMOTHY DAVIS NO. 97183 CIVIL LICENSED PROFESSIONAL ENGINEER

Timothy Davis

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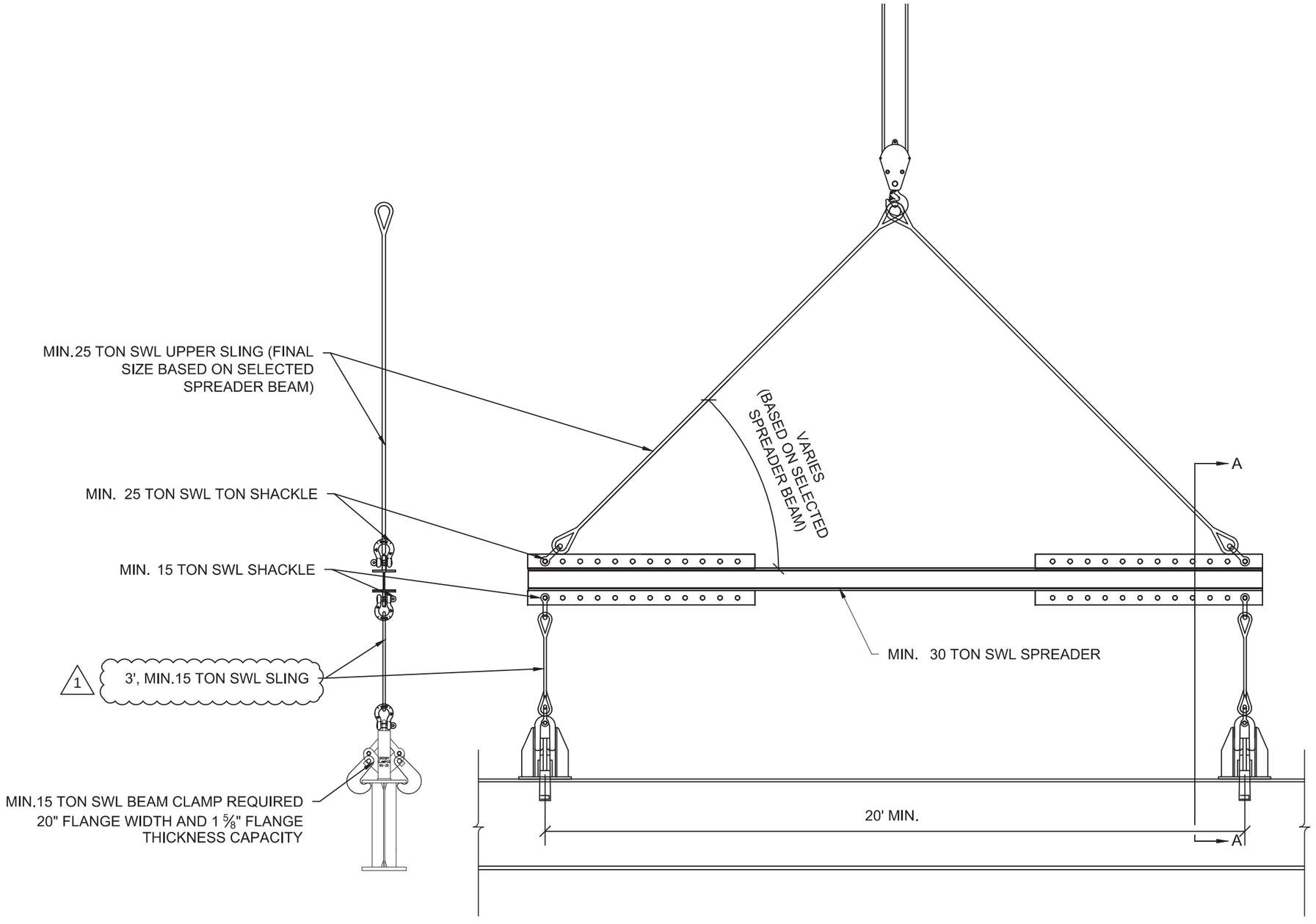

SECTION A-A

SINGLE GIRDER RIGGING DETAIL

Revision No. & Date	Vermont Agency of Transportation			Drawing Status		Name	Date	PCL Civil Constructors, Inc. 3810 Northdale Blvd. Suite 200, Tampa Florida 33624 (813)-264-9500 ; Fax: (813)-264-6689	
Rev. 1. 4/28/2015				Apr 29 2015 2:36 PM	Drawn By	AJT	04/01/15		
	Road No.	County / City	Financial Project ID No.	FOR CONSTRUCTION	Design By	AJT	04/01/15	Submittal LATERAL SLIDE SYSTEM	PCL Project / Job No. I-91 Hartford / 5514001
	I-91	Windsor / Hartford	IM 091-2(79)		Check By	TMD	04/07/15	Drawing Title SINGLE GIRDER RIGGING	Sheet No. 02

Engineer's Seal: STATE OF VERMONT · TIMOTHY M. DAVIS · NO. 97183 · CIVIL · LICENSED · PROFESSIONAL ENGINEER

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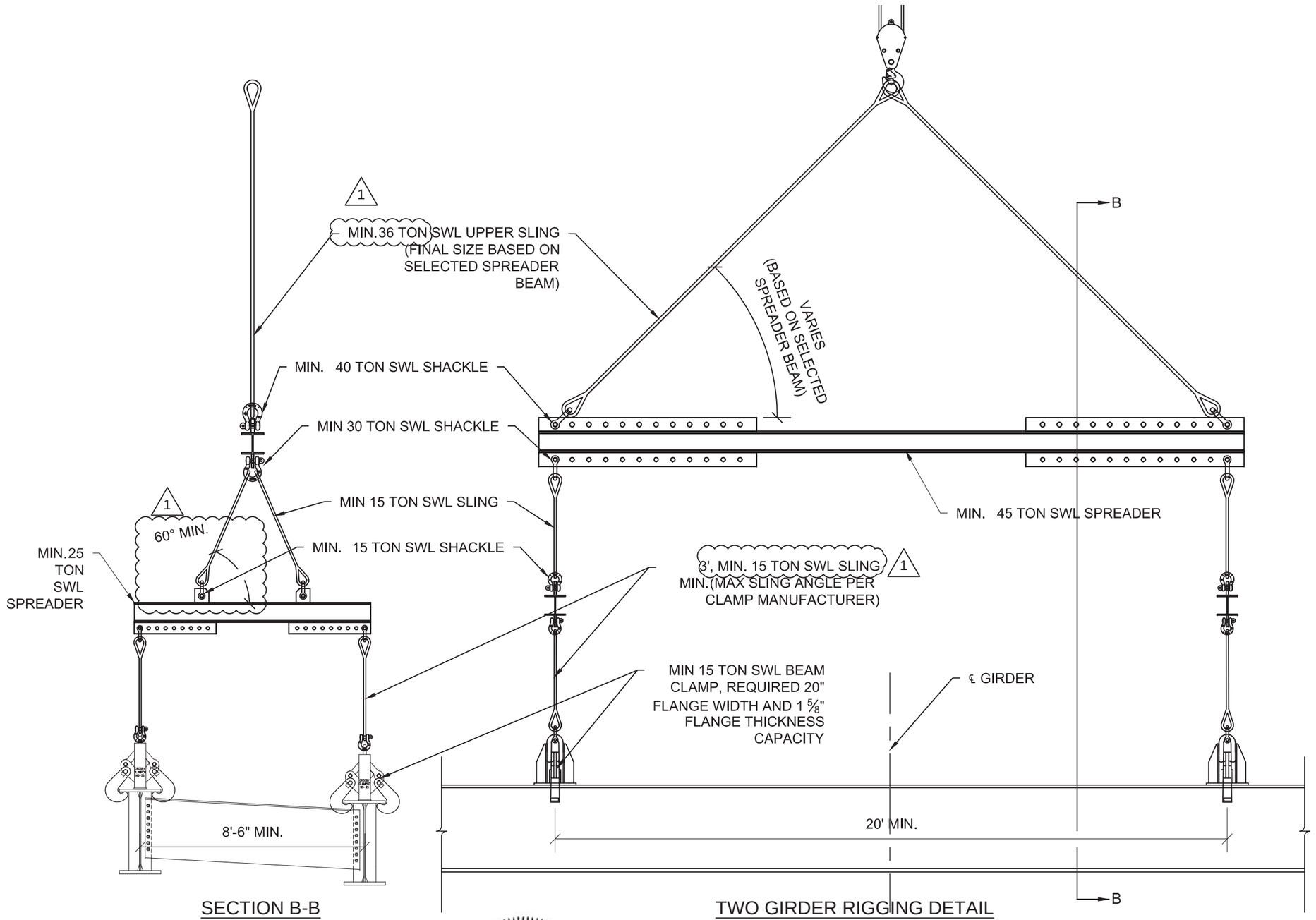

SECTION B-B

TWO GIRDER RIGGING DETAIL

Revision No. & Date	Vermont Agency of Transportation			Drawing Status		Name	Date	PCL Civil Constructors, Inc. 3810 Northdale Blvd. Suite 200, Tampa Florida 33624 (813)-264-9500 ; Fax: (813)-264-6689	
Rev. 1. 4/28/2015				Apr 29 2015 2:36 PM	Drawn By	AJT	04/01/15		
	Road No.	County / City	Financial Project ID No.	FOR CONSTRUCTION	Design By	AJT	04/01/15	Submittal LATERAL SLIDE SYSTEM	PCL Project / Job No. I-91 Hartford / 5514001
	I-91	Windsor / Hartford	IM 091-2(79)		Check By	TMD	04/07/15	Drawing Title TWO GIRDER RIGGING	Sheet No. 03

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Not Valid Unless Digitally Signed

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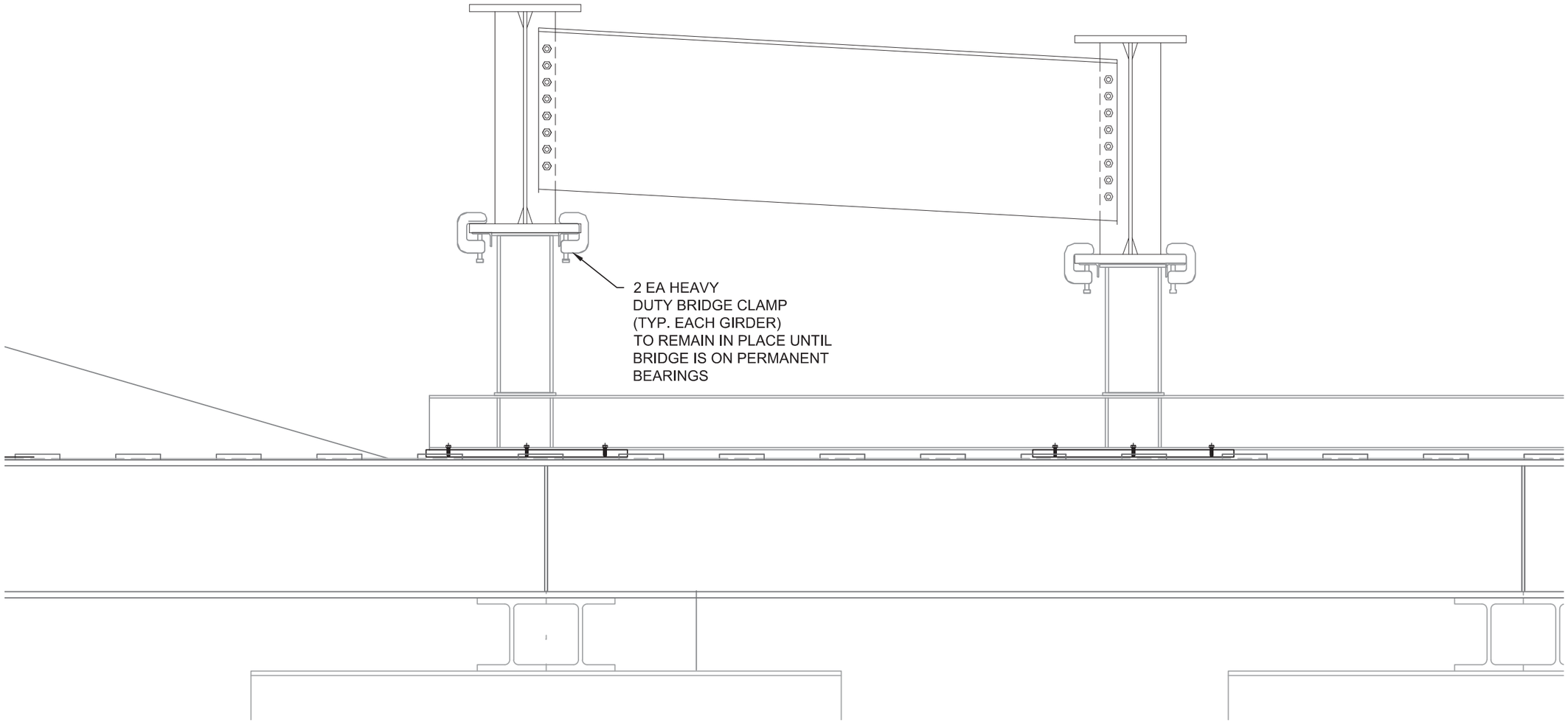

TEMPORARY BRACE DETAIL

Revision No. & Date	Vermont Agency of Transportation			Engineer's Seal	Drawing Status		Name	Date	PCL Civil Constructors, Inc. 3810 Northdale Blvd. Suite 200, Tampa Florida 33624 (813)-264-9500 ; Fax: (813)-264-6689	
				STATE OF VERMONT TIMOTHY DAVIS NO. 97183 CIVIL LICENSED PROFESSIONAL ENGINEER	Apr 29 2015 2:36 PM	Drawn By	AJT	04/01/15		
	Road No.	County / City	Financial Project ID No.		FOR CONSTRUCTION	Design By	AJT	04/01/15	Submittal LATERAL SLIDE SYSTEM	PCL Project / Job No. I-91 Hartford / 5514001
	I-91	Windsor / Hartford	IM 091-2(79)			Check By	TMD	04/07/15	Drawing Title TEMP. RESTRAINT DETAILS	Sheet No. 04

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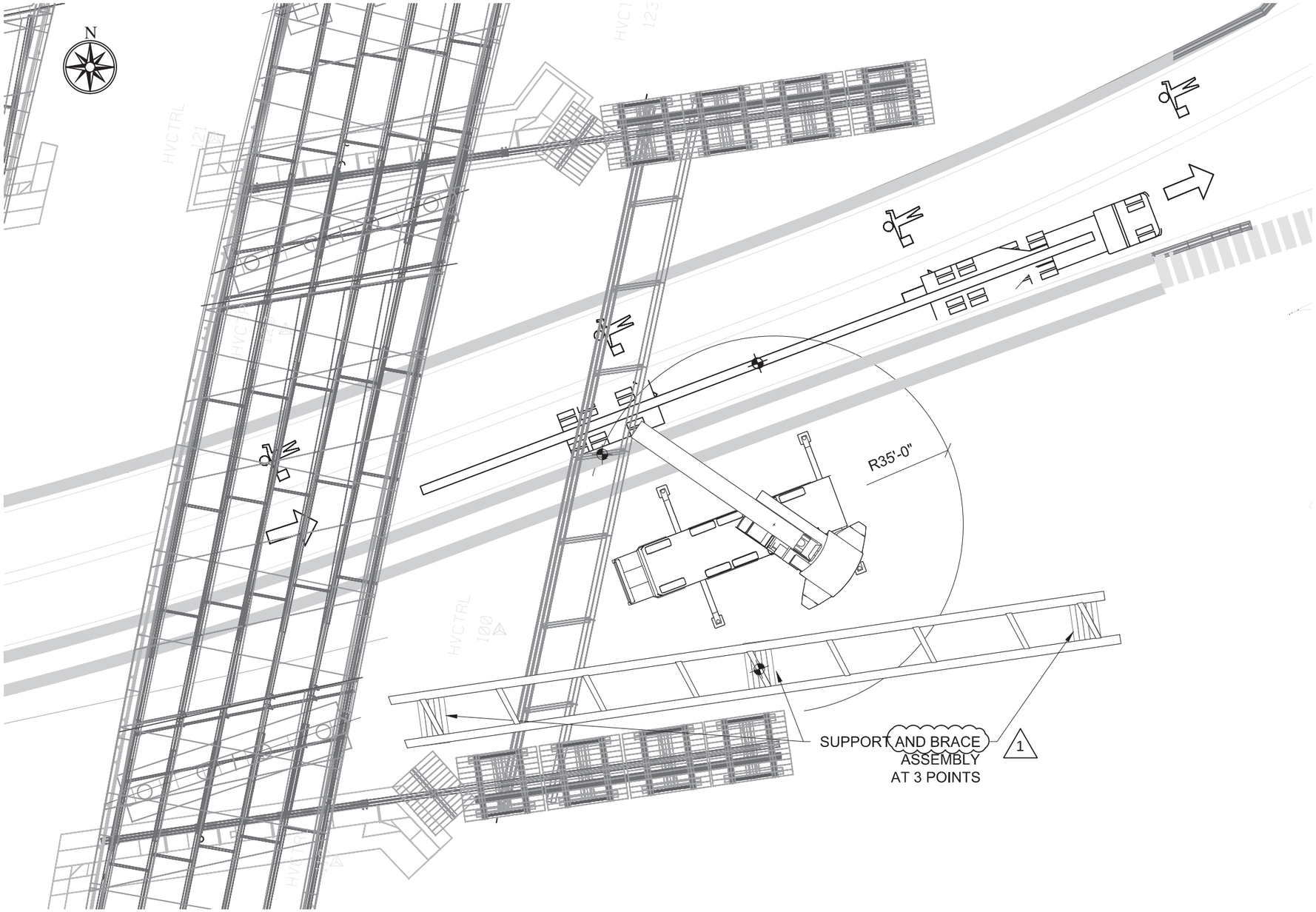

CRANE INFO:		Grove GMK 5275, 77T CWT, 100% OUTRIGGERS
BOOM LENGTH:	ft	89.3
GIRDER MARK:		G1 - G2
GIRDER WEIGHT:	lbs	89,941
PICK WEIGHT + RIGGING:	lbs	102,446
MAX. CRANE RADIUS:	ft	35
CRANE CAPACITY:	ft	135,000
% OF CHART:		76%

STAGE 1

1. SET UP FLAGGING OPERATION ON US-5.
2. RIG TO G1 PER DETAILS ON SHEET 02.
3. RAISE GIRDER TO RELEASE ALL LOAD FROM DELIVERY TRUCK.
4. ROTATE GIRDER TO STAGING LOCATION.
5. REPEAT STEPS 2-4 FOR GIRDER G2.
6. INSTALL ALL DIAPHRAGMS. INSTALL ALL BOLTS, FINGER TIGHT.
7. RIG TO G1-G2 ASSEMBLY PER SHEET 03.
8. STOP TRAFFIC ON US-5.
9. LIFT ASSEMBLY AND ROTATE INTO POSITION.
10. INSTALL TEMPORARY RESTRAINTS AT GIRDER ENDS PER DETAILS ON SHEET 04.
11. RELEASE GIRDER FROM CRANE AND ROTATE BOOM CLEAR OF TRAVEL LANES.
12. RELEASE TRAFFIC ON US-5.

1

NORTHBOUND ERECTION - STAGE 1

Revision No. & Date	Vermont Agency of Transportation			Drawing Status		Name	Date	PCL Civil Constructors, Inc. 3810 Northdale Blvd. Suite 200, Tampa Florida 33624 (813)-264-9500 ; Fax: (813)-264-6689	
Rev. 1. 4/28/2015				Apr 29 2015 2:36 PM	Drawn By	AJT	04/01/15		
	Road No.	County / City	Financial Project ID No.	FOR CONSTRUCTION	Design By	AJT	04/01/15	Submittal LATERAL SLIDE SYSTEM	PCL Project / Job No. I-91 Hartford / 5514001
	I-91	Windsor / Hartford	IM 091-2(79)		Check By	TMD	04/07/15	Drawing Title NORTHBOUND - STAGE 1	Sheet No. 05

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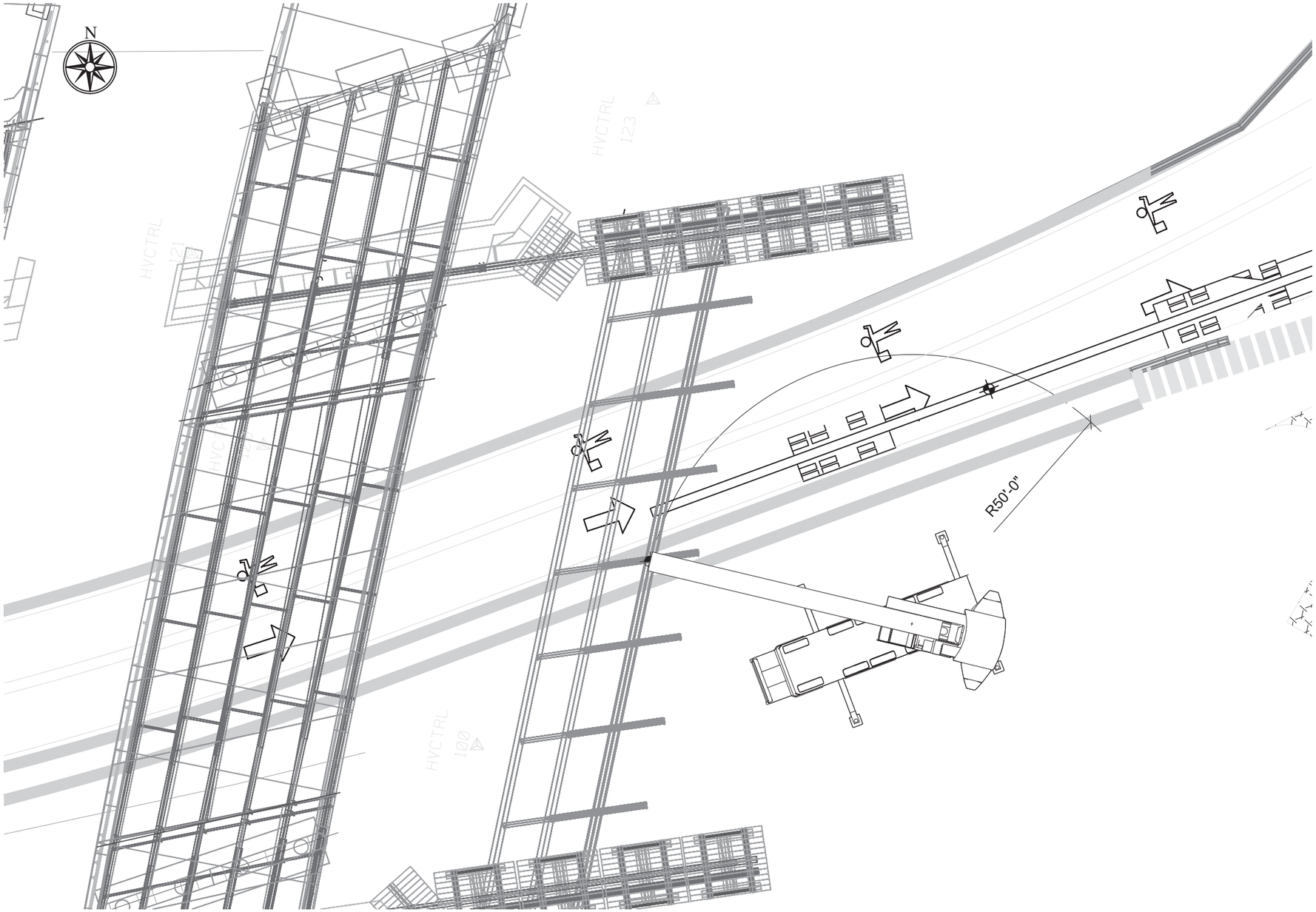

CRANE INFO:		Grove GMK 5275, 77T CWT, 100% OUTRIGGERS
BOOM LENGTH:	ft	89.3
GIRDER MARK:		G3
GIRDER WEIGHT:	lbs	52,055
PICK WEIGHT + RIGGING:	lbs	60,555
MAX. CRANE RADIUS:	ft	55
CRANE CAPACITY:	ft	84,000
% OF CHART:		72%

STAGE 2

NOTE: PICK WEIGHT INCLUDES WEIGHT OF 18 DIAPHRAGMS

1. RELOCATE CRANE TO POSITION SHOWN.
2. SET UP FLAGGING OPERATION ON US-5.
3. PRE INSTALL ALL END DIAPHRAGMS AND A MINIMUM OF EVERY OTHER DIAPHRAGM ONTO GIRDER. INSTALL AND SNUG TIGHTEN ALL CONNECTION BOLTS.
4. RIG TO GIRDER PER DETAILS ON SHEET 02.
5. STOP TRAFFIC ON US-5.
6. RAISE GIRDER TO RELEASE ALL LOAD FROM DELIVERY TRUCK.
7. ROTATE GIRDER AND SET INTO PLACE.
8. INSTALL A MINIMUM OF ONE BOLT, FINGER TIGHT, IN THE TOPS OF AT LEAST TWO DIAPHRAGMS AT MIDSPAN. INSTALL A MINIMUM OF ONE BOLT, FINGER TIGHT, IN THE TOP AND BOTTOM OF EACH END DIAPHRAGM.
9. CLAMP ENDS OF GIRDER AS SHOWN ON SHEET 04.
10. RELEASE GIRDER FROM CRANE AND ROTATE BOOM CLEAR OF TRAVEL LANES.
11. PUSH BOTTOM OF G3 UNTIL BOTTOM DIAPHRAGM HOLES LINE UP.
12. INSTALL REMAINING BOLTS AND DIAPHRAGMS, FLAGGING TRAFFIC AS REQUIRED.

1

NORTHBOUND ERECTION - STAGE 2

Revision No. & Date	Vermont Agency of Transportation			Drawing Status		Name	Date	PCL Civil Constructors, Inc.	
Rev. 1. 4/28/2015				Apr 29 2015 2:37 PM	Drawn By	AJT	04/01/15	3810 Northdale Blvd. Suite 200, Tampa Florida 33624 (813)-264-9500 ; Fax: (813)-264-6689	
	Road No.	County / City	Financial Project ID No.	FOR CONSTRUCTION	Design By	AJT	04/01/15	Submittal LATERAL SLIDE SYSTEM	PCL Project / Job No. I-91 Hartford / 5514001
	I-91	Windsor / Hartford	IM 091-2(79)		Check By	TMD	04/07/15	Drawing Title NORTHBOUND - STAGE 2	Sheet No. 06

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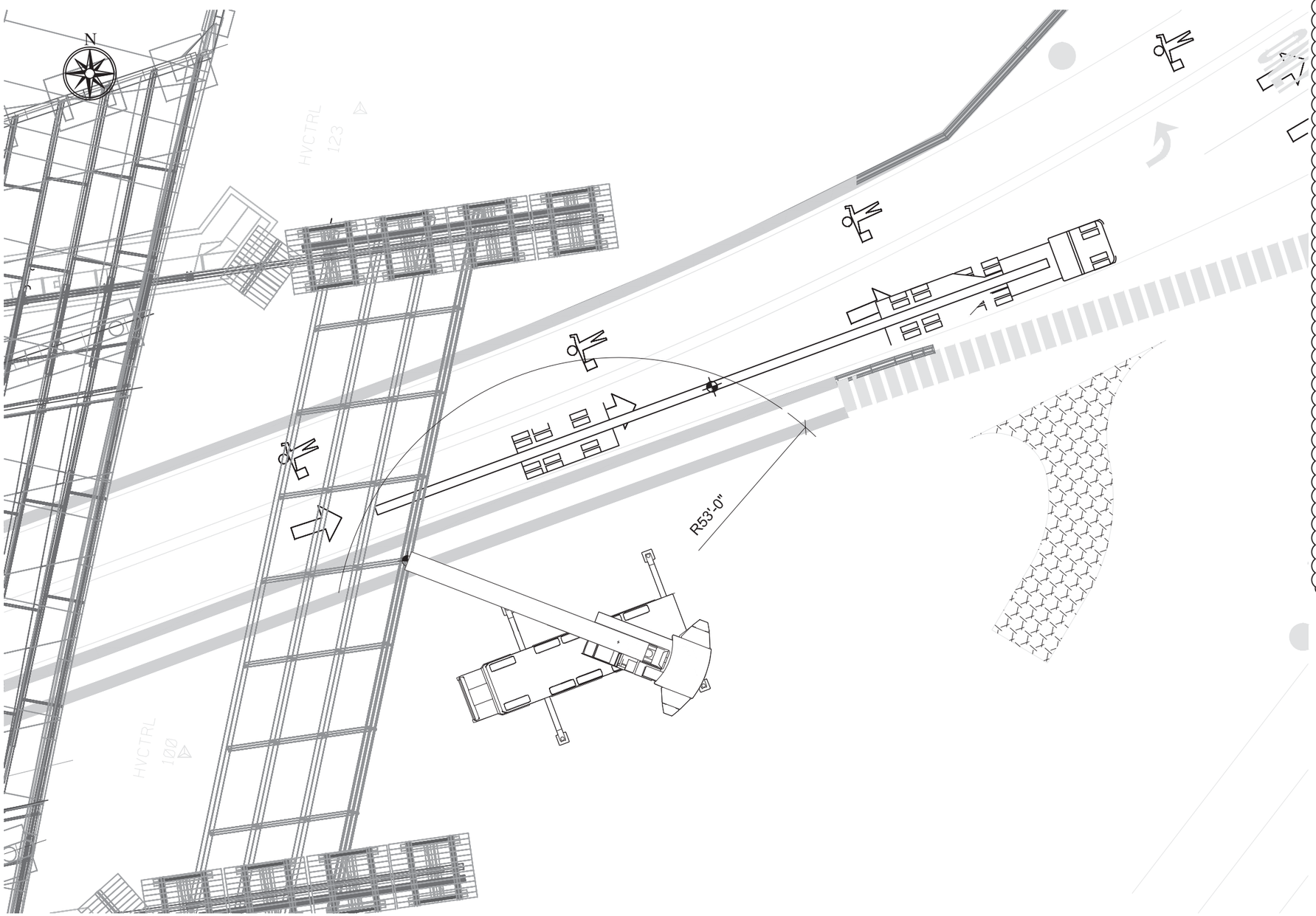

CRANE INFO:		Grove GMK 5275, 77T CWT, 100% OUTRIGGERS
BOOM LENGTH:	ft	89.3
GIRDER MARK:		G4
GIRDER WEIGHT:	lbs	38,055
PICK WEIGHT + RIGGING:	lbs	46,555
MAX. CRANE RADIUS:	ft	70
CRANE CAPACITY:	ft	60,000
% OF CHART:		78%

STAGE 3

1. SET UP FLAGGING OPERATION ON US-5.
2. RIG TO GIRDER PER DETAILS ON SHEET 02.
3. STOP TRAFFIC ON US-5.
4. RAISE GIRDER TO RELEASE ALL LOAD FROM DELIVERY TRUCK.
5. ROTATE GIRDER AND SET INTO PLACE.
6. CLAMP ENDS OF GIRDER AS SHOWN ON SHEET 04.
7. INSTALL A MINIMUM OF ONE BOLT, FINGER TIGHT, IN THE TOPS OF AT LEAST TWO DIAPHRAGMS AT MIDSPAN. INSTALL A MINIMUM OF ONE BOLT, FINGER TIGHT, IN THE TOP AND BOTTOM OF EACH END DIAPHRAGM.
8. RELEASE GIRDER FROM CRANE AND ROTATE BOOM CLEAR OF TRAVEL LANES.
9. PUSH BOTTOM OF G4 UNTIL BOTTOM DIAPHRAGM HOLES LINE UP.
10. INSTALL REMAINING BOLTS, FLAGGING TRAFFIC AS REQUIRED.

1

NORTHBOUND ERECTION - STAGE 3

Revision No. & Date	Vermont Agency of Transportation			Engineer of Record	Drawing Status		Name	Date	PCL Civil Constructors, Inc. 3810 Northdale Blvd. Suite 200, Tampa Florida 33624 (813)-264-9500 ; Fax: (813)-264-6689	
Rev. 1. 4/28/2015				STATE OF VERMONT TIMOTHY M. DAVIS NO. 97183 CIVIL LICENSED PROFESSIONAL ENGINEER	Apr 29 2015 2:37 PM FOR CONSTRUCTION	Drawn By	AJT	04/01/15		
	Road No.	County / City	Financial Project ID No.			Design By	AJT	04/01/15	Submittal LATERAL SLIDE SYSTEM	PCL Project / Job No. I-91 Hartford / 5514001
	I-91	Windsor / Hartford	IM 091-2(79)			Check By	TMD	04/07/15	Drawing Title NORTHBOUND - STAGE 3	Sheet No. 07

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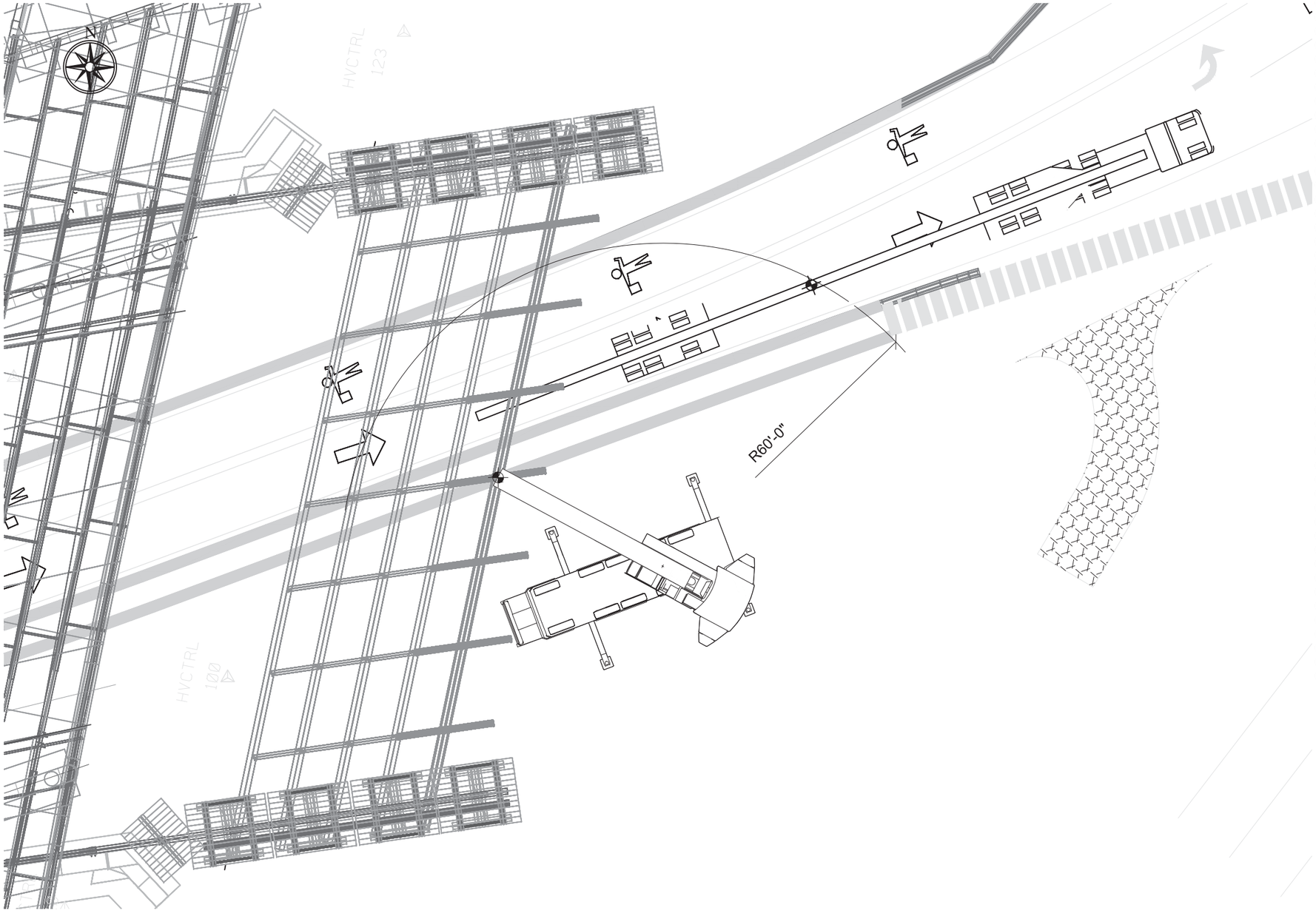

CRANE INFO:		Grove GMK 5275, 77T CWT, 100% OUTRIGGERS
BOOM LENGTH:	ft	89.3
GIRDER MARK:		G5
GIRDER WEIGHT:	lbs	52,059
PICK WEIGHT + RIGGING:	lbs	60,559
MAX. CRANE RADIUS:	ft	55
CRANE CAPACITY:	ft	84,000
% OF CHART:		72%

STAGE 4

NOTE: PICK WEIGHT INCLUDES WEIGHT OF 18 DIAPHRAGMS

1. SET UP FLAGGING OPERATION ON US-5.
3. PRE INSTALL ALL END DIAPHRAGMS AND A MINIMUM OF EVERY OTHER DIAPHRAGM ONTO GIRDER. INSTALL AND SNUG TIGHTEN ALL CONNECTION BOLTS.
4. RIG TO GIRDER PER DETAILS ON SHEET 02.
5. STOP TRAFFIC ON US-5.
6. RAISE GIRDER TO RELEASE ALL LOAD FROM DELIVERY TRUCK.
7. ROTATE GIRDER AND SET INTO PLACE.
8. INSTALL A MINIMUM OF ONE BOLT, FINGER TIGHT, IN THE TOPS OF AT LEAST TWO DIAPHRAGMS AT MIDSPAN. INSTALL A MINIMUM OF ONE BOLT, FINGER TIGHT, IN THE TOP AND BOTTOM OF EACH END DIAPHRAGM.
9. CLAMP ENDS OF GIRDER AS SHOWN ON SHEET 04.
10. RELEASE GIRDER FROM CRANE AND ROTATE BOOM CLEAR OF TRAVEL LANES.
11. PUSH BOTTOM OF G5 UNTIL BOTTOM DIAPHRAGM HOLES LINE UP.
12. INSTALL REMAINING BOLTS AND DIAPHRAGMS, FLAGGING TRAFFIC AS REQUIRED.

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NORTHBOUND ERECTION - STAGE 4

Revision No. & Date	Vermont Agency of Transportation			Engineer of Record	Drawing Status		Name	Date	PCL Civil Constructors, Inc. 3810 Northdale Blvd. Suite 200, Tampa Florida 33624 (813)-264-9500 ; Fax: (813)-264-6689	
Rev. 1. 4/28/2015				STATE OF VERMONT TIMOTHY M. DAVIS NO. 97183 CIVIL LICENSED PROFESSIONAL ENGINEER	Apr 29 2015 2:37 PM	Drawn By	AJT	04/01/15		
	Road No.	County / City	Financial Project ID No.		FOR CONSTRUCTION	Design By	AJT	04/01/15	Submittal LATERAL SLIDE SYSTEM	PCL Project / Job No. I-91 Hartford / 5514001
	I-91	Windsor / Hartford	IM 091-2(79)			Check By	TMD	04/07/15	Drawing Title NORTHBOUND - STAGE 4	Sheet No. 08

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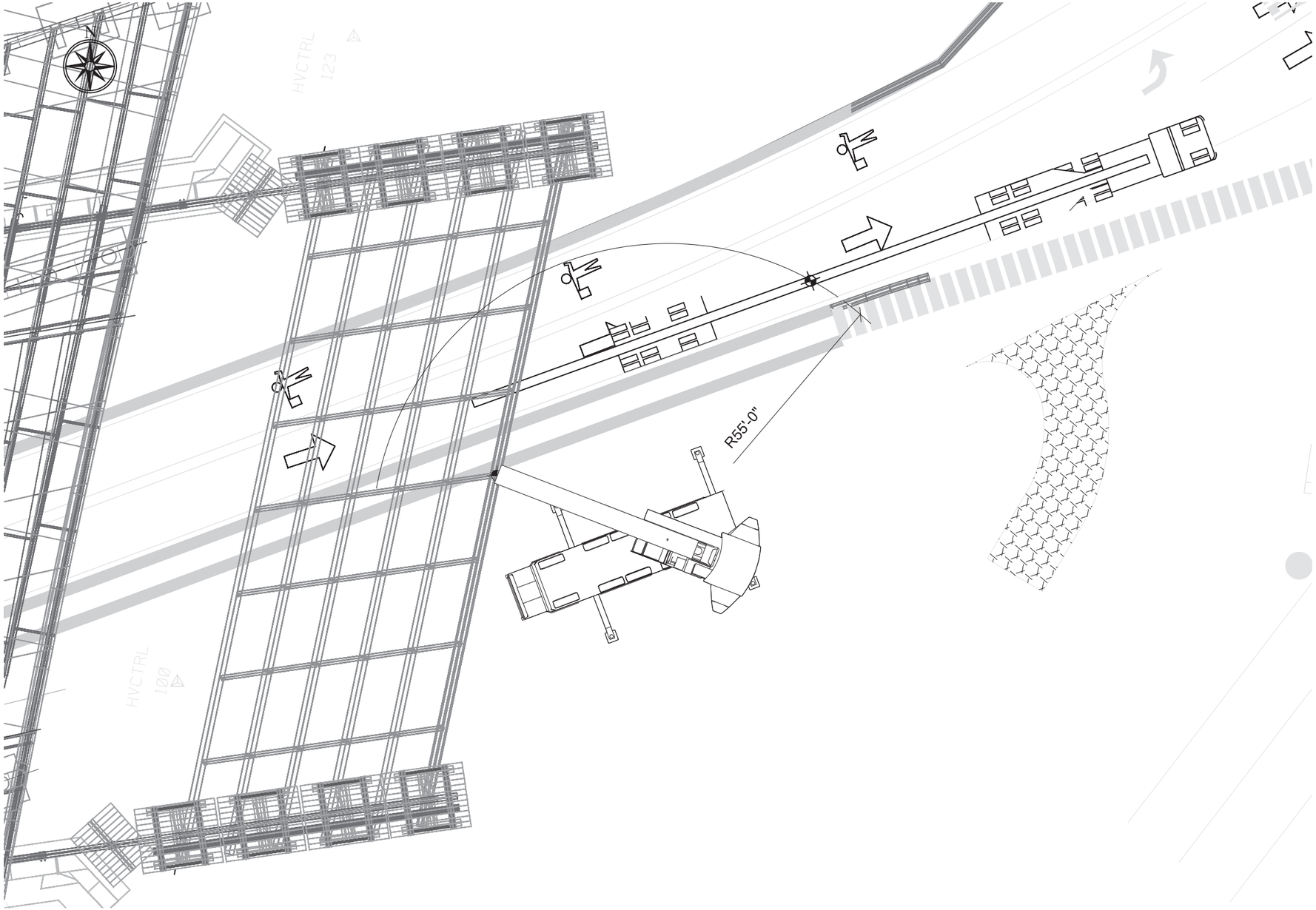

CRANE INFO:		Grove GMK 5275, 77T CWT, 100% OUTRIGGERS
BOOM LENGTH:	ft	89.3
GIRDER MARK:		G6
GIRDER WEIGHT:	lbs	37,866
PICK WEIGHT + RIGGING:	lbs	46,366
MAX. CRANE RADIUS:	ft	70
CRANE CAPACITY:	ft	60,000
% OF CHART:		77%

STAGE 5

1. RELOCATE CRANE TO POSITION SHOWN.
2. SET UP FLAGGING OPERATION ON US-5.
3. RIG TO GIRDER PER DETAILS ON SHEET 02.
4. STOP TRAFFIC ON US-5.
5. RAISE GIRDER TO RELEASE ALL LOAD FROM DELIVERY TRUCK.
6. ROTATE GIRDER AND SET INTO PLACE.
7. INSTALL A MINIMUM OF ONE BOLT, FINGER TIGHT, IN THE TOPS OF AT LEAST TWO DIAPHRAGMS AT MIDSPAN. INSTALL A MINIMUM OF ONE BOLT, FINGER TIGHT, IN THE TOP AND BOTTOM OF EACH END DIAPHRAGM.
8. CLAMP ENDS OF GIRDER AS SHOWN ON SHEET 04.
9. RELEASE GIRDER FROM CRANE AND ROTATE BOOM CLEAR OF TRAVEL LANES.
10. PUSH BOTTOM OF G6 UNTIL BOTTOM DIAPHRAGM HOLES LINE UP.
11. INSTALL REMAINING BOLTS, FLAGGING TRAFFIC AS REQUIRED.

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NORTHBOUND ERECTION - STAGE 5

Revision No. & Date	Vermont Agency of Transportation			Engineer's Seal	Drawing Status		Name	Date	PCL Civil Constructors, Inc. 3810 Northdale Blvd. Suite 200, Tampa Florida 33624 (813)-264-9500 ; Fax: (813)-264-6689	
Rev. 1. 4/28/2015				STATE OF VERMONT TIMOTHY M. DAVIS NO. 97183 CIVIL LICENSED PROFESSIONAL ENGINEER	Apr 29 2015 2:37 PM	Drawn By	AJT	04/01/15		
	Road No.	County / City	Financial Project ID No.		FOR CONSTRUCTION	Design By	AJT	04/01/15	Submittal LATERAL SLIDE SYSTEM	PCL Project / Job No. I-91 Hartford / 5514001
	I-91	Windsor / Hartford	IM 091-2(79)			Check By	TMD	04/07/15	Drawing Title NORTHBOUND - STAGE 5	Sheet No. 09

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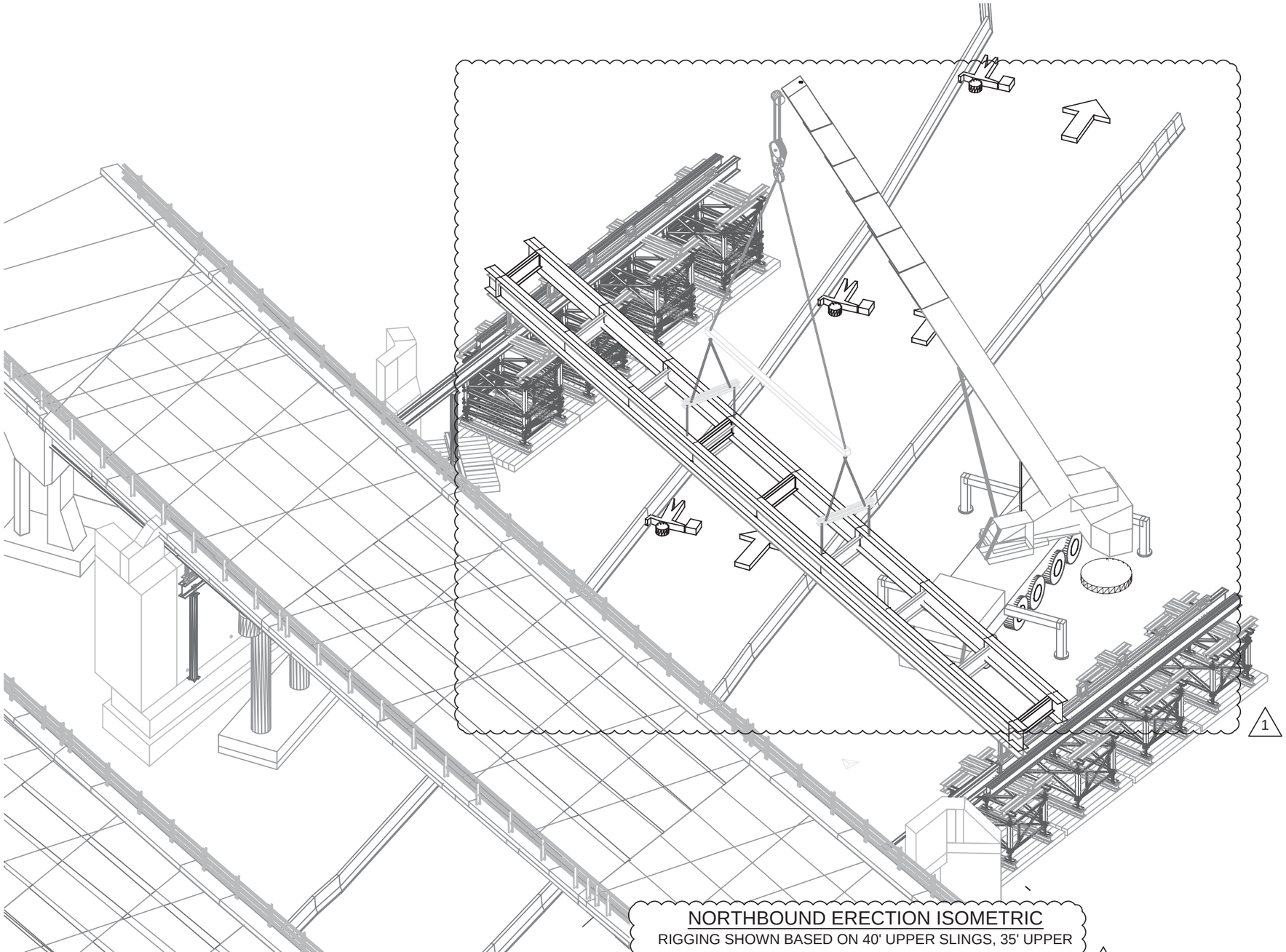

NORTHBOUND ERECTION ISOMETRIC

RIGGING SHOWN BASED ON 40' UPPER SLINGS, 35' UPPER SPREADER AND 10' MIDDLE SLINGS

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Revision No. & Date	Vermont Agency of Transportation			Drawing Status		Name	Date	PCL Civil Constructors, Inc. 3810 Northdale Blvd. Suite 200, Tampa Florida 33624 (813)-264-9500 ; Fax: (813)-264-6689	
Rev. 1. 4/28/2015				Apr 29 2015 2:37 PM	Drawn By	AJT	04/01/15		
	Road No.	County / City	Financial Project ID No.	FOR CONSTRUCTION	Design By	AJT	04/01/15	Submittal LATERAL SLIDE SYSTEM	PCL Project / Job No. I-91 Hartford / 5514001
	I-91	Windsor / Hartford	IM 091-2(79)		Check By	TMD	04/07/15	Drawing Title NORTHBOUND ISOMETRIC	Sheet No. 10

Engineer's Seal

STATE OF VERMONT
TIMOTHY DAVIS
NO. 97183
CIVIL
LICENSED
PROFESSIONAL ENGINEER

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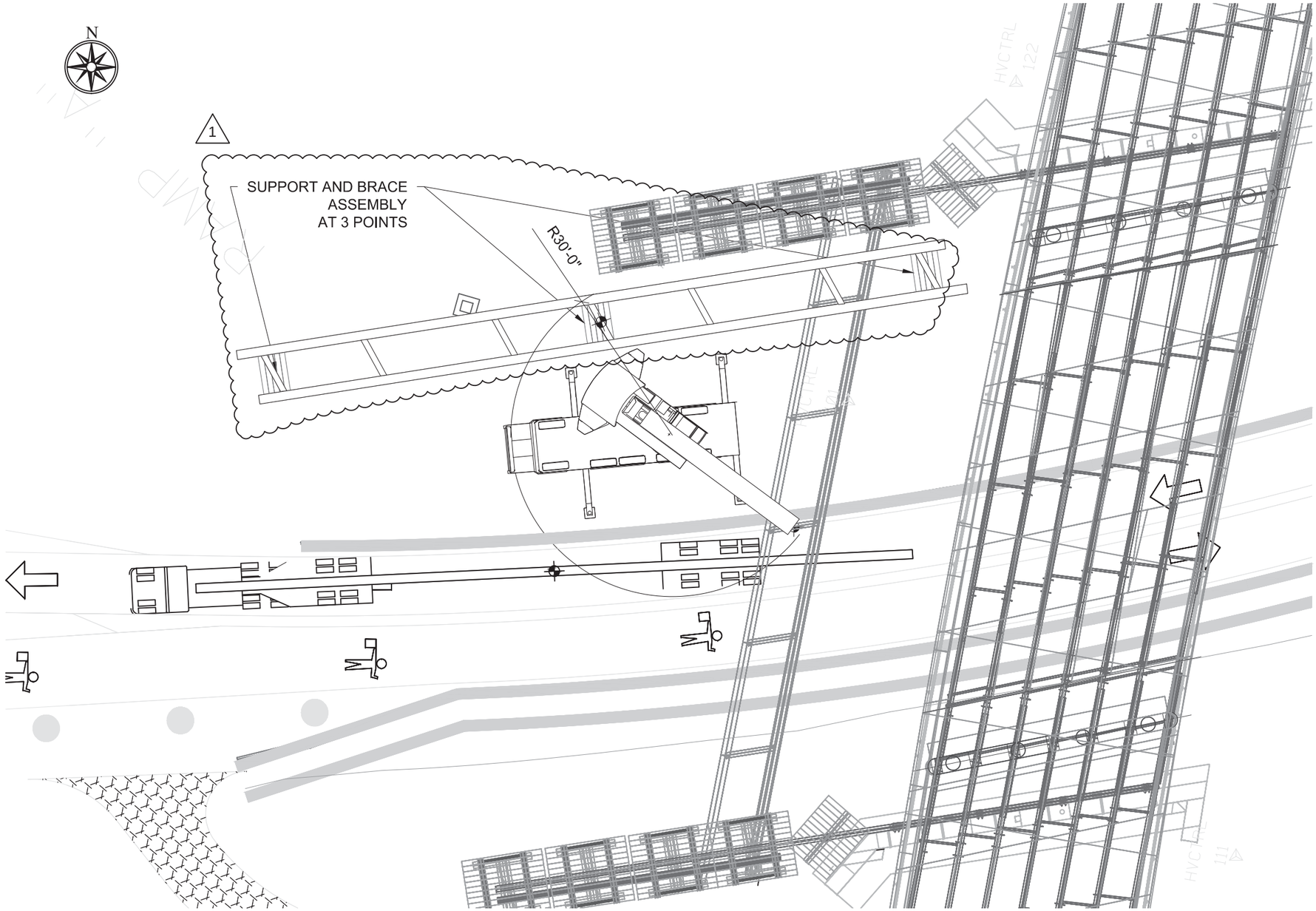

CRANE INFO:		Grove GMK 5275, 77T CWT, 100% OUTRIGGERS
BOOM LENGTH:	ft	89.3
GIRDER MARK:		G5 - G6
GIRDER WEIGHT:	lbs	94,325
PICK WEIGHT + RIGGING:	lbs	106,830
MAX. CRANE RADIUS:	ft	30
CRANE CAPACITY:	ft	155,000
% OF CHART:		69%

STAGE 1

1. SET UP FLAGGING OPERATION ON US-5.
2. RIG TO G6 PER DETAILS ON SHEET 02.
3. RAISE GIRDER TO RELEASE ALL LOAD FROM DELIVERY TRUCK.
4. ROTATE GIRDER TO STAGING LOCATION.
5. REPEAT STEPS 2-4 FOR GIRDER G5.
6. INSTALL ALL DIAPHRAGMS. INSTALL ALL BOLTS, FINGER TIGHT.
7. RIG TO G5-G6 ASSEMBLY PER SHEET 03.
8. STOP TRAFFIC ON US-5.
9. LIFT ASSEMBLY AND ROTATE INTO POSITION.
10. INSTALL TEMPORARY RESTRAINTS AT GIRDER ENDS PER DETAILS ON SHEET 04.
11. RELEASE GIRDER FROM CRANE AND ROTATE BOOM CLEAR OF TRAVEL LANES.
12. RELEASE TRAFFIC ON US-5.

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SOUTHBOUND ERECTION - STAGE 1

Revision No. & Date	Vermont Agency of Transportation			Drawing Status		Name	Date	PCL Civil Constructors, Inc.	
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	Road No.	County / City	Financial Project ID No.	FOR CONSTRUCTION	Design By	AJT	04/01/15	Submittal LATERAL SLIDE SYSTEM	PCL Project / Job No. I-91 Hartford / 5514001
	I-91	Windsor / Hartford	IM 091-2(79)		Check By	TMD	04/07/15	Drawing Title SOUTHBOUND - STAGE 1	Sheet No. 11

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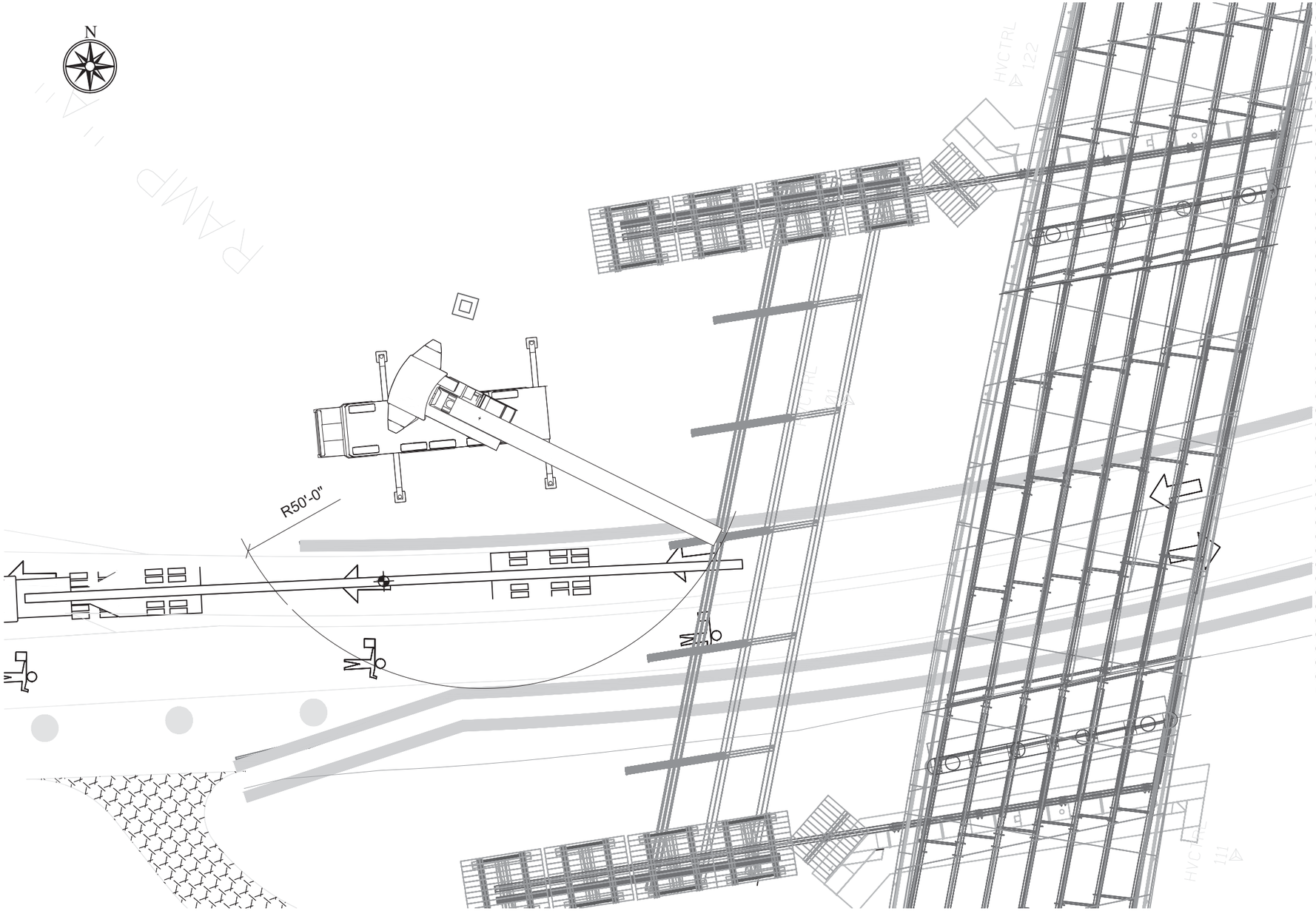

CRANE INFO:		Grove GMK 5275, 77T CWT, 100% OUTRIGGERS
BOOM LENGTH:	ft	89.3
GIRDER MARK:		G4
GIRDER WEIGHT:	lbs	56,225
PICK WEIGHT + RIGGING:	lbs	64,725
MAX. CRANE RADIUS:	ft	55
CRANE CAPACITY:	ft	84,000
% OF CHART:		77%

STAGE 2

NOTE: PICK WEIGHT INCLUDES WEIGHT OF 14 DIAPHRAGMS

1. RELOCATE CRANE TO POSITION SHOWN.
2. SET UP FLAGGING OPERATION ON US-5.
3. PRE INSTALL ALL END DIAPHRAGMS AND A MINIMUM OF EVERY OTHER DIAPHRAGM ONTO GIRDER. INSTALL AND SNUG TIGHTEN ALL CONNECTION BOLTS.
4. RIG TO GIRDER PER DETAILS ON SHEET 02.
5. STOP TRAFFIC ON US-5.
6. RAISE GIRDER TO RELEASE ALL LOAD FROM DELIVERY TRUCK.
7. ROTATE GIRDER AND SET INTO PLACE.
8. INSTALL A MINIMUM OF ONE BOLT, FINGER TIGHT, IN THE TOPS OF AT LEAST TWO DIAPHRAGMS AT MIDSPAN. INSTALL A MINIMUM OF ONE BOLT, FINGER TIGHT, IN THE TOP AND BOTTOM OF EACH END DIAPHRAGM.
9. CLAMP ENDS OF GIRDER AS SHOWN ON SHEET 04.
10. RELEASE GIRDER FROM CRANE AND ROTATE BOOM CLEAR OF TRAVEL LANES.
11. PUSH BOTTOM OF G4 UNTIL BOTTOM DIAPHRAGM HOLES LINE UP.
12. INSTALL REMAINING BOLTS AND DIAPHRAGMS, FLAGGING TRAFFIC AS REQUIRED.

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SOUTHBOUND ERECTION - STAGE 2

Revision No. & Date	Vermont Agency of Transportation			Drawing Status		Name	Date	PCL Civil Constructors, Inc. 3810 Northdale Blvd. Suite 200, Tampa Florida 33624 (813)-264-9500 ; Fax: (813)-264-6689	
Rev. 1. 4/28/2015				Apr 29 2015 2:37 PM	Drawn By	AJT	04/01/15		
	Road No.	County / City	Financial Project ID No.	FOR CONSTRUCTION	Design By	AJT	04/01/15	Submittal LATERAL SLIDE SYSTEM	PCL Project / Job No. I-91 Hartford / 5514001
	I-91	Windsor / Hartford	IM 091-2(79)		Check By	TMD	04/07/15	Drawing Title SOUTHBOUND - STAGE 2	Sheet No. 12

STATE OF VERMONT TIMOTHY M. DAVIS NO. 97183 CIVIL LICENSED PROFESSIONAL ENGINEER

Finished Design

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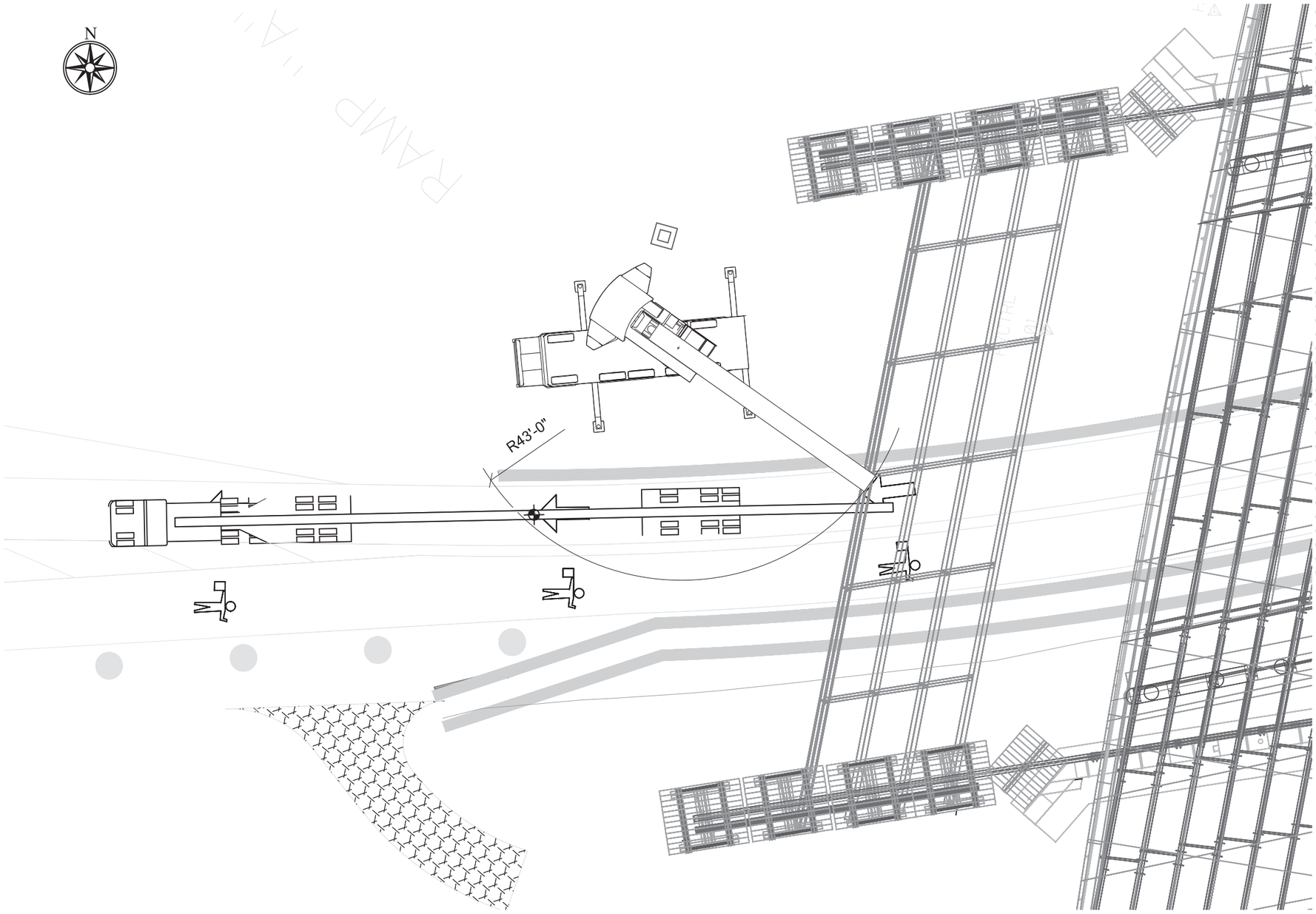

CRANE INFO:		Grove GMK 5275, 77T CWT, 100% OUTRIGGERS
BOOM LENGTH:	ft	89.3
GIRDER MARK:		G3
GIRDER WEIGHT:	lbs	38,225
PICK WEIGHT + RIGGING:	lbs	46,725
MAX. CRANE RADIUS:	ft	65
CRANE CAPACITY:	ft	60,000
% OF CHART:		78%

STAGE 3

1. SET UP FLAGGING OPERATION ON US-5.
2. RIG TO GIRDER PER DETAILS ON SHEET 02.
3. STOP TRAFFIC ON US-5.
4. RAISE GIRDER TO RELEASE ALL LOAD FROM DELIVERY TRUCK.
5. ROTATE GIRDER AND SET INTO PLACE.
6. INSTALL A MINIMUM OF ONE BOLT, FINGER TIGHT, IN THE TOPS OF AT LEAST TWO DIAPHRAGMS AT MIDSPAN. INSTALL A MINIMUM OF ONE BOLT, FINGER TIGHT, IN THE TOP AND BOTTOM OF EACH END DIAPHRAGM.
7. CLAMP ENDS OF GIRDER AS SHOWN ON SHEET 04.
8. RELEASE GIRDER FROM CRANE AND ROTATE BOOM CLEAR OF TRAVEL LANES.
9. PUSH BOTTOM OF G3 UNTIL BOTTOM DIAPHRAGM HOLES LINE UP.
10. INSTALL REMAINING BOLTS, FLAGGING TRAFFIC AS REQUIRED.

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SOUTHBOUND ERECTION - STAGE 3

Revision No. & Date	Vermont Agency of Transportation			Drawing Status		Name	Date	PCL Civil Constructors, Inc.	
Rev. 1. 4/28/2015				Apr 29 2015 2:37 PM	Drawn By	AJT	04/01/15	3810 Northdale Blvd. Suite 200, Tampa Florida 33624 (813)-264-9500 ; Fax: (813)-264-6689	
	Road No.	County / City	Financial Project ID No.	FOR CONSTRUCTION	Design By	AJT	04/01/15	Submittal LATERAL SLIDE SYSTEM	PCL Project / Job No. I-91 Hartford / 5514001
	I-91	Windsor / Hartford	IM 091-2(79)		Check By	TMD	04/07/15	Drawing Title SOUTHBOUND - STAGE 3	Sheet No. 13

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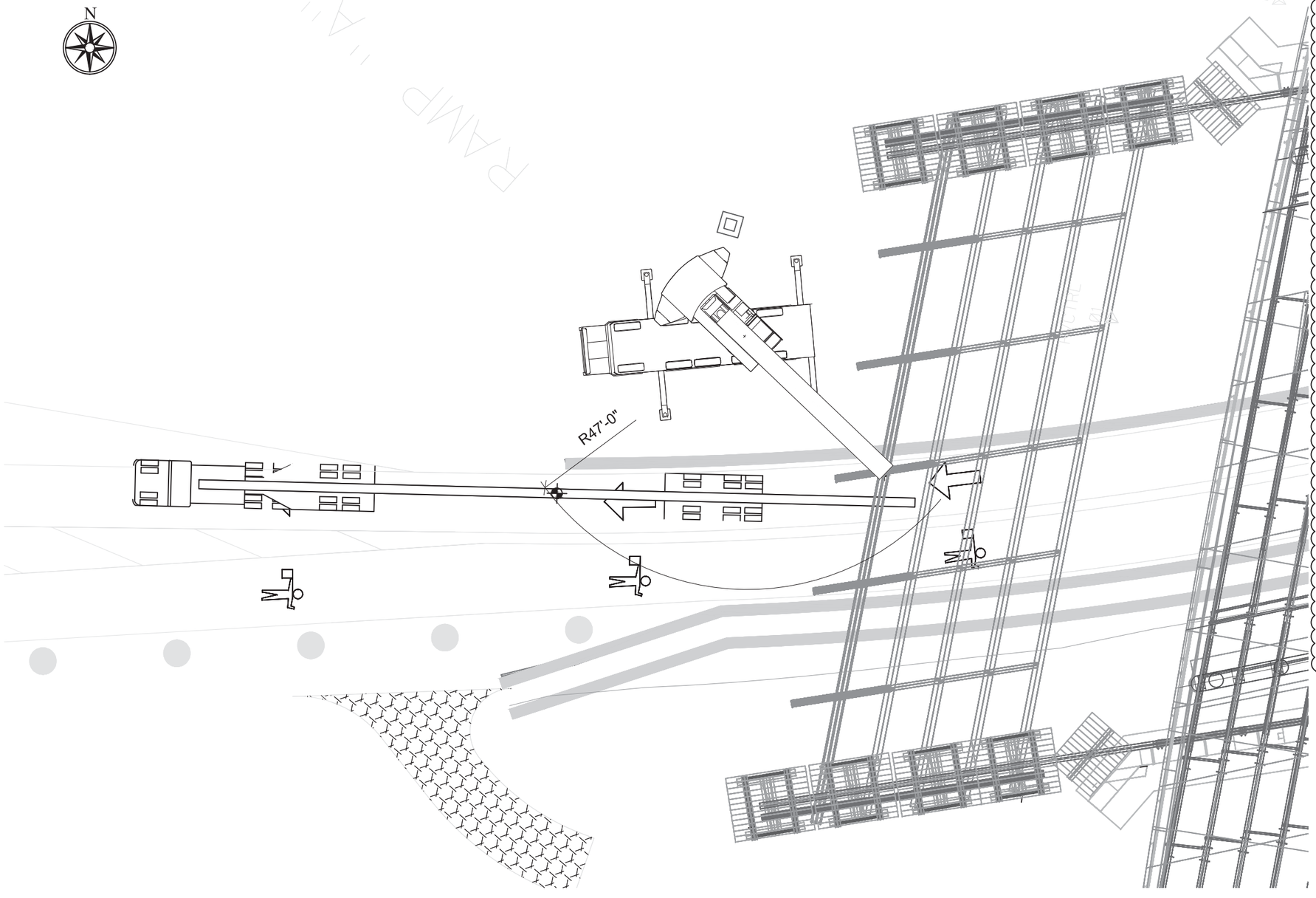

CRANE INFO:		Grove GMK 5275, 77T CWT, 100% OUTRIGGERS
BOOM LENGTH:	ft	89.3
GIRDER MARK:		G2
GIRDER WEIGHT:	lbs	56,225
PICK WEIGHT + RIGGING:	lbs	64,725
MAX. CRANE RADIUS:	ft	55
CRANE CAPACITY:	ft	84,000
% OF CHART:		77%

STAGE 4

NOTE: PICK WEIGHT INCLUDES WEIGHT OF 14 DIAPHRAGMS

1. SET UP FLAGGING OPERATION ON US-5.
2. PRE INSTALL ALL END DIAPHRAGMS AND A MINIMUM OF EVERY OTHER DIAPHRAGM ONTO GIRDER. INSTALL AND SNUG TIGHTEN ALL CONNECTION BOLTS.
3. RIG TO GIRDER PER DETAILS ON SHEET 02.
4. STOP TRAFFIC ON US-5.
5. RAISE GIRDER TO RELEASE ALL LOAD FROM DELIVERY TRUCK.
6. ROTATE GIRDER AND SET INTO PLACE.
7. INSTALL A MINIMUM OF ONE BOLT, FINGER TIGHT, IN THE TOPS OF AT LEAST TWO DIAPHRAGMS AT MIDSPAN. INSTALL A MINIMUM OF ONE BOLT, FINGER TIGHT, IN THE TOP AND BOTTOM OF EACH END DIAPHRAGM.
8. CLAMP ENDS OF GIRDER AS SHOWN ON SHEET 04.
9. RELEASE GIRDER FROM CRANE AND ROTATE BOOM CLEAR OF TRAVEL LANES.
10. PUSH BOTTOM OF G2 UNTIL BOTTOM DIAPHRAGM HOLES LINE UP.
11. INSTALL REMAINING BOLTS AND DIAPHRAGMS, FLAGGING TRAFFIC AS REQUIRED.

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SOUTHBOUND ERECTION - STAGE 4

Revision No. & Date	Vermont Agency of Transportation			Engineer's Seal	Drawing Status		Name	Date	PCL Civil Constructors, Inc. 3810 Northdale Blvd. Suite 200, Tampa Florida 33624 (813)-264-9500 ; Fax: (813)-264-6689	
Rev. 1. 4/28/2015				STATE OF VERMONT TIMOTHY M. DAVIS NO. 97183 CIVIL LICENSED PROFESSIONAL ENGINEER	Apr 29 2015 2:37 PM	Drawn By	AJT	04/01/15		
	Road No.	County / City	Financial Project ID No.		FOR CONSTRUCTION	Design By	AJT	04/01/15	Submittal LATERAL SLIDE SYSTEM	PCL Project / Job No. I-91 Hartford / 5514001
	I-91	Windsor / Hartford	IM 091-2(79)			Check By	TMD	04/07/15	Drawing Title SOUTHBOUND - STAGE 4	Sheet No. 14

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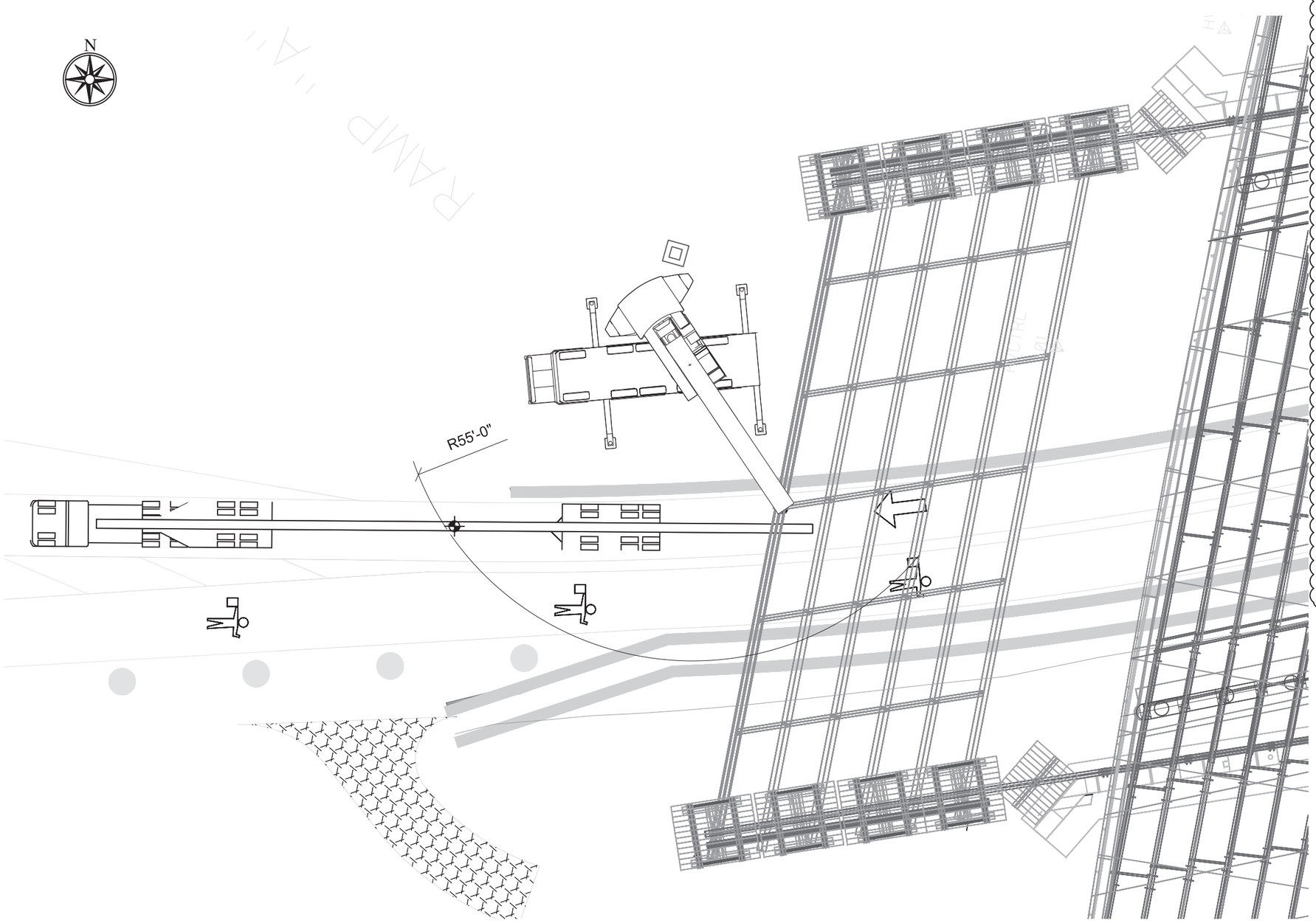

CRANE INFO:		Grove GMK 5275, 77T CWT, 100% OUTRIGGERS
BOOM LENGTH:	ft	89.3
GIRDER MARK:		G1
GIRDER WEIGHT:	lbs	38,100
PICK WEIGHT + RIGGING:	lbs	46,600
MAX. CRANE RADIUS:	ft	60
CRANE CAPACITY:	ft	75,000
% OF CHART:		62%

STAGE 5

1. SET UP FLAGGING OPERATION ON US-5.
2. RIG TO GIRDER PER DETAILS ON SHEET 02.
3. STOP TRAFFIC ON US-5.
4. RAISE GIRDER TO RELEASE ALL LOAD FROM DELIVERY TRUCK.
5. ROTATE GIRDER AND SET INTO PLACE.
6. INSTALL A MINIMUM OF ONE BOLT, FINGER TIGHT, IN THE TOPS OF AT LEAST TWO DIAPHRAGMS AT MIDSPAN. INSTALL A MINIMUM OF ONE BOLT, FINGER TIGHT, IN THE TOP AND BOTTOM OF EACH END DIAPHRAGM.
7. CLAMP ENDS OF GIRDER AS SHOWN ON SHEET 04.
8. RELEASE GIRDER FROM CRANE AND ROTATE BOOM CLEAR OF TRAVEL LANES.
9. PUSH BOTTOM OF G1 UNTIL BOTTOM DIAPHRAGM HOLES LINE UP.
10. INSTALL REMAINING BOLTS, FLAGGING TRAFFIC AS REQUIRED.

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SOUTHBOUND ERECTION - STAGE 5

Revision No. & Date	Vermont Agency of Transportation			Drawing Status		Name	Date	PCL Civil Constructors, Inc. 3810 Northdale Blvd. Suite 200, Tampa Florida 33624 (813)-264-9500 ; Fax: (813)-264-6689	
Rev. 1. 4/28/2015				Apr 29 2015 2:37 PM	Drawn By	AJT	04/01/15		
	Road No.	County / City	Financial Project ID No.	FOR CONSTRUCTION	Design By	AJT	04/01/15	Submittal LATERAL SLIDE SYSTEM	PCL Project / Job No. I-91 Hartford / 5514001
	I-91	Windsor / Hartford	IM 091-2(79)		Check By	TMD	04/07/15	Drawing Title SOUTHBOUND - STAGE 5	Sheet No. 15

Engineering Document
STATE OF VERMONT TIMOTHY M. DAVIS NO. 97183 CIVIL LICENSED PROFESSIONAL ENGINEER

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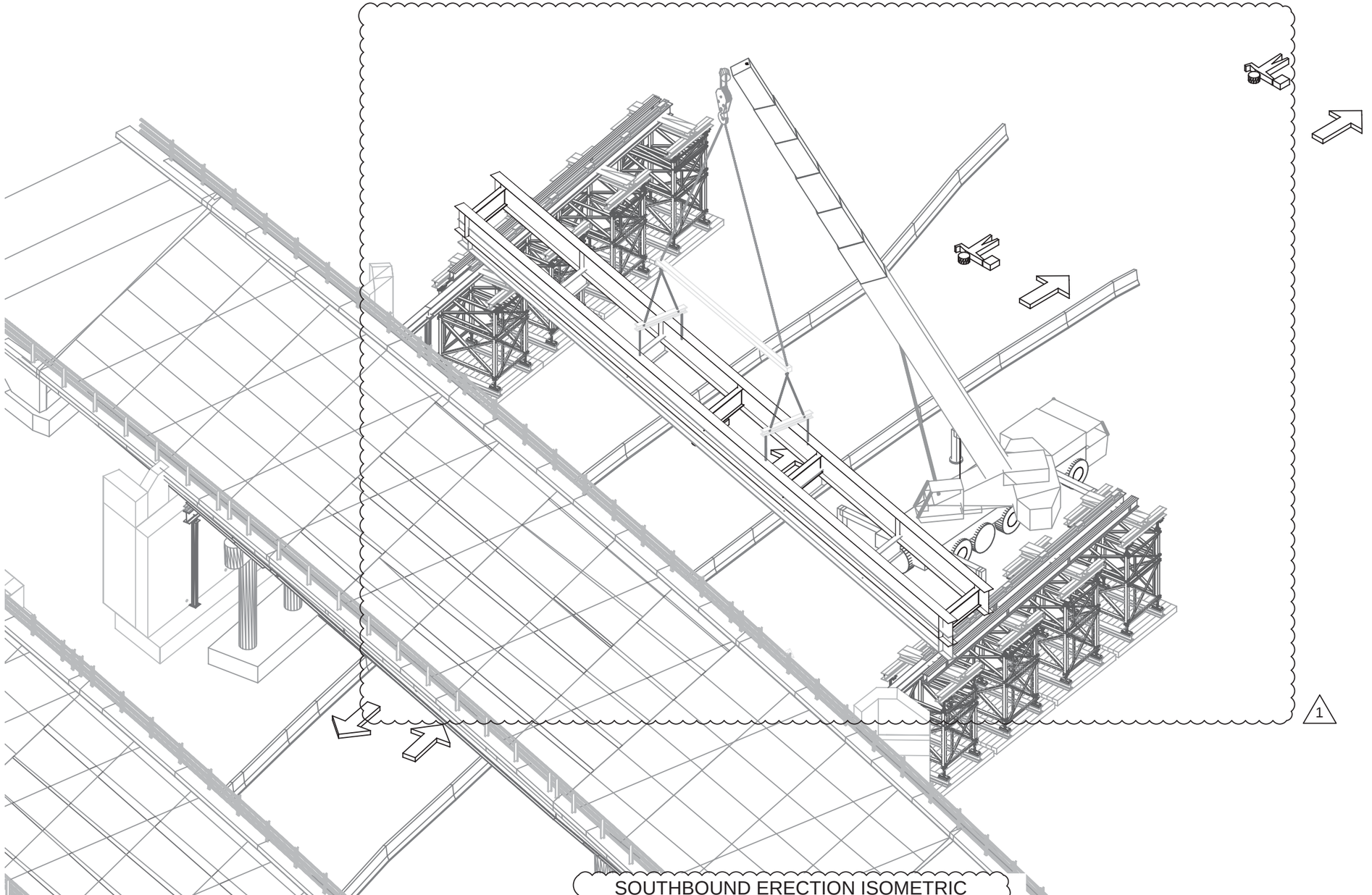

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SOUTHBOUND ERECTION ISOMETRIC

RIGGING SHOWN BASED ON 40' UPPER SLINGS, 35' UPPER SPREADER AND 10' MIDDLE SLINGS

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Revision No. & Date	Vermont Agency of Transportation			Engineer's Seal	Drawing Status		Name	Date	PCL Civil Constructors, Inc. 3810 Northdale Blvd. Suite 200, Tampa Florida 33624 (813)-264-9500 ; Fax: (813)-264-6689	
Rev. 1. 4/28/2015				STATE OF VERMONT TIMOTHY M. DAVIS NO. 97183 CIVIL LICENSED PROFESSIONAL ENGINEER	Apr 29 2015 2:37 PM	Drawn By	AJT	04/01/15		
	Road No.	County / City	Financial Project ID No.		FOR CONSTRUCTION	Design By	AJT	04/01/15	Submittal LATERAL SLIDE SYSTEM	PCL Project / Job No. I-91 Hartford / 5514001
	I-91	Windsor / Hartford	IM 091-2(79)			Check By	TMD	04/07/15	Drawing Title SOUTHBOUND ISOMETRIC	Sheet No. 16

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